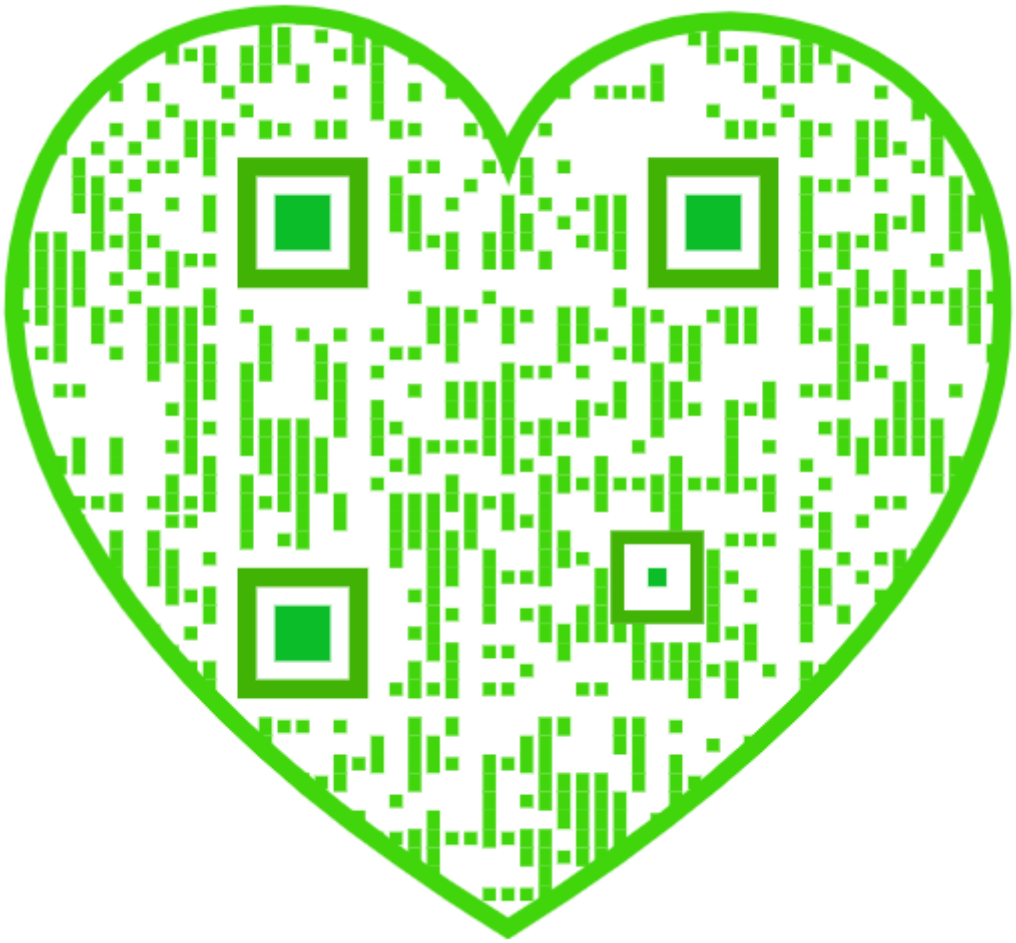
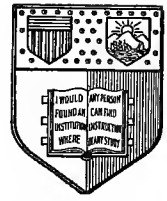
MAKING A FISHERY.

F. M. HALFORD.





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MAKING A FISHERY.

Yours faithfully

Frederic M. Bedford.

MAKING A FISHERY.

BY

FREDERIC M. HALFORD

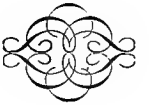
("DETACHED BADGER" OF "THE FIELD")

AUTHOR OF

"FLOATING FLIES AND HOW TO DRESS THEM,"

AND

"DRY-FLY FISHING IN THEORY AND PRACTICE."



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CHAPTER I.

SELECTION.

THE Angler in search of water has generally little choice, and hence, although it is undoubtedly useful to lay down the salient points which should guide him in his selection, yet, unfortunately, he has but seldom the chance of considering them fully. He answers a certain number of advertisements, each of which sets forth that good trout fishing is to be let with or without (generally with) a large and expensive house and grounds. Before many letters have passed between him and the agents he finds, as a rule, that the fishing is either of small extent, in a river of poor reputation, hampered by inconvenient, if not impossible conditions, or that the proposition is to let it only from year to year, at as high a rental as possible, while the proprietor himself is to have a concurrent right, and to do nothing whatever to improve or stock the water. Granted, however, that a

Choice of water limited.

seemingly eligible length of water is offered on seemingly fair terms, the intending lessee will soon be able to find out whether it is likely to suit him.

Advice not to bid against an existing tenant.

Before opening negotiations there is an important point which should be clearly understood. If the water is let, the date at which the present tenant's term expires should be ascertained; also whether he is desirous of renewing his agreement, and whether any correspondence on the subject is being carried on between the proprietor or any other person on his behalf and the present tenant. If it is discovered that any such negotiation is in progress, the advice I would proffer to any good sportsman is to refuse to give the matter any consideration until the negotiation with the present tenant is definitely abandoned.

The object of an agent in trying to induce anyone to negotiate under these circumstances is to make a catspaw of him, and use any offer he may make for the purpose of raising the rent against the existing tenant, or otherwise forcing him to accede to unreasonable conditions for fear of losing the water altogether. I would warn my readers that they must not expect gratitude for following this advice, nor imagine that, when the lease or agreement is renewed on such terms as can be arranged between the

parties, they will receive any thanks or any invitation for a day's fishing on the water.

An example of this occurred in which all details were known to me. An angler, desirous of renting fishing, had the offer of a good stretch of water at a reasonable rental, but in excess of what the tenant was paying under an agreement expiring a few months later. He wrote to the agent declining to entertain the matter until all negotiation with the existing tenant was at an end. He sent a copy of the agent's letter and his reply to the tenant. Profuse expressions of thankfulness were made in answer, and eventually the tenant secured the water on his own terms. This gentleman, who had the reputation of being a thorough sportsman, never even had the politeness to write to the angler who had behaved in so friendly a spirit to tell him that he had secured a fresh lease. Cases like this, however, occur every day, and among all ranks of society.

Extent of water and whether both banks.

Perhaps the first point on which information should be obtained by the intending lessee of a fishery is the extent of the water. In connection with this it is necessary to expose a subterfuge which is too often attempted in the flowery advertisement drawn up by the astute and frequently unscrupulous land agent. It is said that so many miles of trout fishing, or trout

water, are to be let. If the right extends over both sides of the water for a distance of say two miles, both banks are measured, and it is called four miles of water. Then it may be remarked that, unless the exclusive right over both banks is definitely offered, it may be inferred that the proprietor has no good title to more than one side of the river, and if it is in contemplation to improve the fishing by stocking, killing down coarse fish, or in other ways, no sane man would care to take a lease under these conditions. As to the length of the fishery, there is another trick which is often played on the unwary: the great number of miles supposed to be covered by the lease is justified by measuring both banks of every tributary, carrier, and ditch intersecting the water meadows on the property. A little scrutiny will often lay bare the fact that a great proportion of these are positively dry during a considerable part of the fishing season.

If previously let.

Having determined the extent of the fishing, it is well to ascertain if it has been previously let, and, if so, what sport was enjoyed. An interview or interchange of a couple of letters on the subject with the former tenant is advisable, and, if possible, his reason for giving up the water should be ascertained. Information on this point derived from the proprietor

or his agent cannot always be implicitly relied on.

Personal inspection.

At this stage a visit to the river in person is of advantage, and if the intending lessee does not consider himself capable of forming a definite opinion on his own inspection, he should, if possible, persuade some friend, in whose judgment he has confidence, to accompany him. Unfortunately there are no qualified experts who can be retained for a fee to give a proper report on the subject, so that in the absence of a reliable friend one is obliged to act on one's own observation. The general reputation of the river should be ascertained, and it is always well to try and see keepers or proprietors of the adjoining waters, as a careful sifting of their conversation will usually enable one to get some idea of the capabilities and present state of the waters offered.

It must be remembered that the tendency of the rustic is to exaggerate; hence it may be inferred that, if he condemns the fishing, the keepers, and the proprietor in unmeasured terms, they are not quite as black as he paints them; and conversely, if his praise of his neighbours and their property is given too freely, it may equally be inferred that they are not quite so angelic, and their fishing not quite so much of a paradise as his words would lead one to believe.

It is difficult to arrive at any fair notion of the average size of the trout in the river from any description given, whether by proprietor, agent, keeper, neighbour, or even fisherman. One and all are so prone to estimate and not weigh fish, that their estimates are invariably too high. I can give a curious instance of this: After two seasons' fishing on a piece of water where all trout, &c., were weighed and carefully registered, a most respectable professional man residing in a village adjoining the stream, who had fished the water for many years, asked me about the results of our fishing. I told him accurately from the figures that we had killed over 700 trout, averaging 1lb. 9oz. He, in reply, expressed his disappointment at both the number and the average weight. Knowing that in former years it had almost invariably been fished with sunk fly, and that hence it was most improbable that the average weight of the fish killed should have been equal to that achieved by essentially dry-fly fishermen, I asked him a series of questions. His replies, summarised, amounted to this: That the limit of size under the old *régime* was 9in.; that the fishermen never weighed their fish, but took it as a rule that a 9in. trout weighed 1lb. The absurdity of this method of estimating weight is only too apparent, seeing that a 9in. trout in

first-rate condition would seldom, if ever, exceed ½lb. in weight. He, however, admitted, on seeing the register, that the number of large trout, of 2½lb. and upwards, surprised him, as he had never taken one approaching this size, and never suspected that the river contained any of such weight. It was not astonishing that in olden times they killed a far greater number, as their limit was 9in., and ours 13in.

Food supply.

If a river is subject to heavy floods, or if it runs down very much in dry summers, the presumption is that the trout in it are not likely to be free risers, and most frequently, too, in such cases, the supply of food is insufficient for a large head of fish. The question of food can, however, be ascertained by anyone beyond doubt, if he will only take the trouble to dredge with a small net made of cheese cloth among the weeds as well as on the bed of the stream and carriers flowing into it. He should turn the net out into a small quantity of water in a white pudding basin, and examine the contents. In all the better class of chalk streams, such as the Test, Kennet, Itchen, &c., the basin would contain a very great number of living creatures, consisting, among the Crustaceans, chiefly of shrimps (*Gammarus pulex*) and water wood lice (*Asellus aquaticus*); among the Molluscæ, the various genera of water snails, Univalves, such

as *Limnæa*, *Bythinia*, *Planorbis*, *Valvata*, &c., and Bivalves, such as *Sphærium*, &c.; among insects, caddis or larvæ of the *Trichoptera*, larvæ of the Mayfly and smaller *Ephemeridæ*, of the Alder (*Sialis lutaria*), and of the numerous small black flies (*Diptera*), called, in the anglers' slang, curses or smuts. If the result of dredging is to show that generally there is a deficiency of insect life, it may be safely predicted that the trout will not be free risers. If, in addition, the molluscæ and crustaceans are not very plentiful, this particular length of stream is not likely to grow a good stock of well-conditioned fish, and is not therefore a desirable one to rent. If in the future some benefactor to the community can discover an easy method of introducing fresh genera and species to the rivers, as well as the plants on which they subsist, it may be possible to effect great improvements, and thus enhance the value of waters which are at present unfit for the serious attention of anyone desirous of making really good fishing.

Examination of weeds.

The food supply in any river is largely dependent on the presence of the various weeds on which so many of the larvæ, &c., live, as well as of the soil in which these weeds flourish. In many of the north country rivers there are practically no weeds, the bed of the river con-

sisting, in the rapid portions, of bed rock, or at best of only gravel and sand, which is periodically shifted by floods, and would be infallibly swept down towards the sea if it were not for the presence of huge boulders, between which this gravel and sand settles down. Of course, in a very heavy flood even large boulders get washed down. In such rivers the average weight of the trout is much smaller than in the south country chalk streams, but where they are fairly preserved the deficiency in average size is in a degree compensated by the number. Larvæ which do not require weeds, but live among the stones in fast stickles, are plentiful in rivers of this class, while these insects are comparatively rare in the clear streams of Hampshire and Wiltshire. Hence the scarcity, or, in many cases, absence, of such flies as the March Brown (*Ecdyurus venosus*) or the Stone Fly (*Perla cephalotes*) from the Test, Kennet, and other streams of like character.

Classification of weeds.

In classifying the weeds which are of real advantage to a river, and in which the Crustaceans, Molluscæ, Caddis, and larvæ of Ephemeridæ, which are so essential a portion of the natural food of chalk stream trout and grayling, are more or less abundant, the most important is that usually called by anglers "Celery" (*Apium inundatum*). The name

given is due to a resemblance in its growth to that of the ordinary vegetable of the same name. It flourishes in shallow water where there is a fair or strong stream, and roots into the fine gravel. On examining a handful the tyro will be astonished at the abundance of animal life contained therein. It is pre-eminently the form of vegetation to be desired where trout run large and the stock is heavy.

Next to the "celery," perhaps the best food-producing weed is the Water Starwort (*Callitriche aquatica*), one of the most elegant of all the water weeds, and also one which grows in rapid water, and roots in the gravel. The Water Crowfoot (*Ranunculus aquatilis*), which is supposed in a degree to resemble the foliage of the carrot, contains a fair proportion of the larvæ, &c.; but it too often overgrows a stream and crowds out the celery. Some species of the genus Potamogeton are also favourable to the increase of animal life, especially as they are said to contain an abnormally large percentage of nitrogen.

The American weed (*Elodea canadense*) is comparatively useless. At one time it was expected to ruin rivers in which it had been introduced, owing to its rapid and luxuriant growth. It has, however, after some years invariably diminished, and in a few instances disappeared

from places where it had previously flourished. It is said that this disappearance is due to the fact that the plant is dicœcious, that the male plant only has been imported, and that this dies out after about seven years unless reproduced from seed.

The so-called Ribbon Weed (*Sparganium ramosum*) is an unmitigated nuisance in any stream; it contains little or no food for the fish, chokes up the water wherever it is once established, is so firmly rooted that to extirpate it seems impossible, and from the fly fisherman's point of view has the additional disadvantage of being very tough and sharp on either edge, so that a hooked fish running through it can usually manage to cut the gut and get away. I have thought it well to set out this question in some detail under the heading of "Selection," as indicating clearly which are desirable and which undesirable weeds; but it may be taken as an axiom that a good head of well-conditioned trout of average size can only be found in a river where the growth of weeds is luxuriant.

Mud.

It is desirable that there should be a small quantity of mud in some reaches of a fishery. It must not, however, be imagined that the filthy slime left by sewage pollution, or the sediment which is ever accumulating on the

bed of a river where the cut weeds are left to decompose, is what is meant here by the word mud. The assertion, too, that a small quantity of it in portions of the water is an advantage must not be distorted into a statement that the Author advocates the presence of deposits, many feet in thickness, of foul, fœtid black mud in the deeper and slower running reaches of his ideal trout stream. Such is not my intention. The mud I wish to see in a river is that pale coloured, gritty, sandy, and odourless *detritus* in which the celery roots freely and the Mayfly larva loves to burrow, and without which the Mayfly itself cannot be present in great numbers. The larvæ of the Alder, as well as some of the larger Caddis, are invariably plentiful in this class of mud; and, wherever it is found in a stream, there, too, will the largest, best conditioned, and gamest trout congregate and feed.

Accessibility and accommodation.

A matter requiring consideration when determining whether to take or refuse a particular piece of water, is its accessibility. This must depend on a variety of circumstances, such as distance from the nearest railway station, the time occupied in travelling from one's home to the riverside, the train service, the fares, the punctuality of the trains, the available conveyances from the station to the river, &c., &c.

It would obviously be unwise for a fully occupied professional or business man, who can only spare odd days or week-ends from his multifarious duties, to rent water, say, three hours' railway journey, and perhaps ten miles' drive in addition, from his office. On the other hand, the fortunate fisherman whose time is his own, and who loves the peace and quiet of the country, would prefer such a place to one where his calm enjoyment would be marred by the continual clatter of passenger and goods trains shunting at a large junction close to his quarters. Such important matters as the accommodation to be obtained in the village inn or furnished apartments, as well as the facilities for obtaining good and wholesome food, must be factors in the case.

Neighbourhood and scenery.

If he prefers the company of his wife and children when away from home, he must ascertain what walks and drives there are, whether the particular part of the country is healthy, and whether the adjacent villages are in a fairly good sanitary condition. If his better half has no love for comparative solitude, he must discover something about the social status of the neighbours, and of their disposition towards new-comers. In fact, there are innumerable points to be considered, and all of these he must consider and decide quickly, unless he is

prepared to let the water slip through his fingers while he is making up his mind. He must remember that, for every eligible length of trout water in the market, there are hundreds of willing tenants.

CHAPTER II.

TENURE.

A WATER likely to suit having been selected, definite negotiations should be commenced without delay. In indicating the lines on which these should be conducted, with fair prospects of ultimately coming to terms, it must not be imagined that any hard and fast rules can be laid down. Much must depend on the views, and even on the tempers, of the parties concerned, and while it is most undesirable for the intending tenant to show any signs of trying to drive a hard bargain, he must yet at the outset let the proprietor or agent with whom he is treating distinctly understand that he is not a fool, and can take care of himself. His first step should be to get (in writing if possible) a full description of the water, its extent, the term for which it is to be let, the rent asked, the privileges (if any) retained by the proprietor, and other

Commencing the negotiation.

information, such as the number of mills on the property, the millers' rights, &c.

Identification of property.

For the proper identification of the water, and to be able to check the supposed extent of it, the most satisfactory plan is to refer to the Ordnance map of the district. Two Ordnance maps of the entire United Kingdom are published; one on the scale of one inch to the mile, and the second six inches to the mile. A third Ordnance map, on the large scale of twenty-five inches to the mile, is published of the whole of Great Britain, with the exception of a few sparsely populated portions in the north. The one-inch map is useful to give a general idea of the district, and to enable one to ascertain approximately distances from railway stations, &c. The six-inch map shows all roads, divisions of meadows, &c., and in the case of a small length of water would be sufficient for reference.

The twenty-five inch map, however, is the most valuable, especially if the property is at all broken up, or if there is any complication in the boundaries of the fishing. It shows every meadow—in fact, it is even supposed to show every tree in the meadow—every tributary, carrier, ditch, hatch, footpath, bridge, and in the towns and villages every house is marked on it. A distinguishing number is given to each meadow, and its acreage appended to the num-

ber. Even the altitudes above sea level are given in figures at comparatively short intervals. Being on so large a scale, too, it is much easier to read, and less crowded than the smaller scale maps.

Length of lease or agreement.

Of course the term for which the water is to be let must be distinctly specified. Land agents often advise their principals to let fishing from year to year, and, although this advice may be given in all good faith, yet the lessor should remember that the agent's commission is usually payable on each letting, so that, if he can succeed in reletting to the same tenant, or finding a new one each year, he will earn a commission each year instead of receiving his percentage on the rent of the first year of the term only. Sometimes this is avoided by making the agreement what the lawyers call a *continuing* one—that is going on from year to year unless one of the parties gives the other due notice of his intention to determine the agreement. In respect to this plan of letting water for a single season only, the advantages to the lessor are that he need not retain a disagreeable or undesirable tenant longer than a single season. Also that, if he thinks the rent insufficient, he can give his tenant the option of giving up the water or paying an increased rental if he wishes to continue. Certainly, too, he is retaining in his own

hands a more effective control of his property than he would when granting a lease for a term of years. Landed proprietors generally, and especially those of the olden school, attach great importance to this; and no doubt, from their point of view, there are many valid arguments to be adduced in its favour.

Disadvantages of short lease.

The proprietor must, however, consider the disadvantages of this form of letting. A tenant holding water for a single year cannot afford to go to any expense in stocking, netting, and otherwise keeping down coarse fish, nor in protecting the trout from poachers; in fact, he is likely to be tempted to get all the sport he can in any one season, as he cannot be sure of retaining it beyond the term of his agreement. Then, again, although the tenant can be got rid of or his rent raised at the end of any year, yet when he goes it may not be so easy to find a new tenant, especially if the water has been skinned and the stock of fish killed down too much. As far as the fisherman is concerned, if it suits his purpose to fish a water for a season and then either negotiate for a renewal of the same or find something suitable on another property, he may take on a yearly agreement. If, however, he intends to effect permanent improvements he should try and obtain a good lease, say twenty-one years, with option on his

side only of determining the tenure at the expiration of the seventh or fourteenth year.

Rent.

On this question it is difficult to give any special advice. Unfortunately, it is the custom for land agents to advise their clients to ask a higher rent than they really expect to get, and the outcome of this practice is that, as a rule, an intending lessee makes an offer of an amount less than he is prepared to pay. The parties usually haggle and bargain; the land agent declares that there is another man in negotiation who is willing to pay what is asked. Very often this obliging person is a myth, but sometimes, although rarely, he exists, and the effect of a firm attitude is to lose the water altogether. If only agents could be persuaded to see the folly of this policy it would be a good thing for everyone concerned, not only in fisheries but in all other property throughout the country.

With a considerable amount of diffidence, however, the following advice is given to the intending tenant: Make up your mind what the property is worth to you, and make an offer of this amount, conveying in the most distinct words possible the intimation that you are willing to pay this rental and no more. Never mind what pressure may be brought to bear on you, or what specious arguments may be

advanced to try and induce you to give more. Let it be clearly understood that the answer to your offer must be *yes* or *no*. Do not attach any credence to the statement that there is another man willing to give the rent asked. This, if advanced, is clearly not true, as, if such a man existed, the agent would long since have refused your offer definitely and accepted his. In fixing the figure of your offer, however, you should look at the question from a liberal point of view, and make it, if anything, rather on the side of being a trifle higher than your estimate of the value.

Reservations by lessor.

If the proprietor desires to reserve any fishing rights on the water they should be clearly set forth, and perhaps the best and most explicit method of doing this is to offer to let all his fishing rights, which should be specified, with the exception of those reserved, which should also be given in detail. This subject of rights reserved by the freeholder when letting is one which needs careful consideration on the part of a fisherman taking a lease. Some freeholders require a personal right to fish whenever and wherever they wish, and some even demand the additional right of sending one or two friends. The argument generally advanced to induce the future lessee to accede to this is, that the proprietor

does not fish himself, and is only likely to avail himself of the privilege of sending friends to a limited extent. This no doubt is true at the time, but, as soon as the tenant has improved the fishing by stocking and other means, it is quite a different matter. Then all the freeholder's friends keep on asking him for leave, and, very likely hearing of their sport, he will himself take to it, until at last the landlord finds that he has benefited to the extent both of the rent and the improvement in his fishing at the expense of the tenant. It is, therefore, evident that reserved rights should be limited in some way in every equitable agreement.

Of course, if the river runs past the proprietor's house, and is bordered by his lawn, it is reasonable that he should reserve the fishing on that length exclusively for himself and his friends, and it may be fair for him to have the right of fishing himself or sending his friends to any portion of the water for a limited number of days during the season, limiting, too, the number of rods on any one day.

Water rights of millers and others.

Before taking a fishery the tenant should ascertain what mills there are on the property, and what rights of water, &c. have been included in the letting of the mills. As a rule he will find that the right of regulating the height of the water in the millpond so as to

give a reasonable head for working is granted to the miller, also the right to cut weeds obstructing the flow of water either above or below his mill. It is, I believe, held that without any proviso in his lease the tenant of every mill has these rights by the law of the land, but on this point doubts are expressed by eminent legal authorities. If, in addition to these, the miller has any other rights of fishing, eel-catching, keeping ducks on the water, &c., they should be specified. In a water-meadow country the farmer has usually the right to the use of the water for flooding his meadows, and naturally this includes the right of regulating the hatches from the main river into the irrigation carriers, as well as all hatches in these ditches themselves. It should, however, be clearly set forth in a fishing lease that the farmer should have the right to sufficient water for working his meadows, but that the fishing lessee should be entitled to regulate the flow of any surplus beyond the farmer's legitimate requirements. These hatches are a fertile source of annoyance to a fishing tenant, and are often raised and lowered in the interests, if not under the immediate control, of the local poachers, who are thus enabled to levy a heavy toll on the head of fish. Wherever possible, a tenant should arrange that all these hatches

should be kept locked, and the keys intrusted only to the men authorised to move them.

Lease, or conditions of lease or agreement.

All the foregoing points having been satisfactorily settled, and the landlord and tenant being in accord on all debatable points, a proper memorandum should be drawn up and signed by both. For a mere year to year tenancy, this document, although possibly not in strictly legal phraseology, might be sufficient, but, for a lease or agreement for a term of years, a properly drawn up, stamped, and executed deed is necessary. To both lessor and lessee the best advice is to let the matter be carried through by the solicitors; the subject is far too complicated, and the law too abstruse, for laymen to be able to construe it properly. Without any desire to trench on the legal part of the question, and without the necessary knowledge to do so, I think it would be of advantage, as well to the solicitors themselves as to the parties they represent, to enumerate here conditions and covenants which should not be overlooked in drawing the deed. Some of the points have already been referred to in this chapter, and these will be set forth as briefly as possible.

After naming the parties to the lease, it should specify whether the sole and exclusive right of fishing is let, and whether the taking

of eels is also included. The name of the river should be given, and it should be stated that the right is to extend to carriers and ditches, and reference should be made to a plan to be a portion of the lease. As before remarked, it is desirable that this plan should be one of the Ordnance maps. The numbers of the plots (as on the Ordnance map) over which the fishing extends should be enumerated, and it should be stated that all the lessor's rights of fishing on the property are included, excepting such as are specially excepted in subsequent clauses.

It should set forth that the lessee has the right to cut weeds, clear away mud or soil, and deposit them on the banks, and generally do any work deemed desirable for the improvement of the fishery; and it should further recite description or position of any house or keeper's cottages covered by the lease, any right of way required by the lessee to gain access to any portion of the fishing, the term for which and date from which the right is let, the amount of rent, and how payable. The rights, if any, excepted or reserved for the lessor on any portion of the river over which the lessee should not have the right of fishing should be detailed, as well as the right of the lessor, or his servants, to enter for the purpose of repairing banks, cutting down or planting trees or bushes, or to

raise or lower level of water to enable him to carry out any work required in the interests of the property.

Lessee's covenants.

The lessee's covenants should follow: To pay rent, keep a good stock of fish and leave the same at expiration of tenancy, to keep houses or cottages in repair (if this is one of the lessee's obligations), to cut and clear away weeds, to make good any damage occurring to other tenants' land caused by negligence or wilful act on the part of the lessee or his keepers, and not to underlet or assign without assent of lessor, such assent not to be withheld without just and reasonable cause. The lessee should undertake to provide keeper or keepers, to prevent poaching, to fish in a fair and sportsmanlike manner with rod and line only (except in the case of pike, eels, or other coarse fish), to make proper rules for the regulation of the fishery, such rules to be applicable to himself and his friends, and to specify any limits of size or number of *Salmonidæ* to be killed in one day, as well as the seasons during which they can be taken.

Lessor's covenants.

The lessor's covenants should set forth that he should pay all rates. This is a moot point, and one that sometimes leads to long discussion. It is, however, desirable that the rent should be fixed at a figure sufficiently high to warrant the lessor in doing so. If the lessee has to

pay rates the local authorities are prone to assess the sporting rights at an excessive sum, as they argue that the London gentlemen coming down there to fish should be made to contribute liberally towards the rates. If the rates are paid by the landlord they do not seem to realise that they are included in the rent, and are apt to consider that their own neighbour, as lord of the manor, should not be bled as freely as a stranger. There are other reasons, such as the liability to be summoned on juries, &c., why the tenant should, if possible, try and be exempt from assessment.

The lessor must undertake to lower and regulate water level as required by the lessee for the purpose of weed-cutting and netting. This is necessary because the regulation of hatches in such cases is usually in the discretion of the millers and farmers. They may or may not be on good terms with the fishing tenant. If he is a man of sense and judgment he will do all in his power to be friendly with them; but occasionally there are millers and farmers who resent the intrusion of any so-called stranger, and who might refuse to raise or lower hatches, and thus effectually prevent the tenant from carrying out his obligations to cut and remove weeds, net, &c.

The lessor should further undertake to keep

in repair all banks, hatches, sluices, and carriers, and this is not unreasonable, seeing that he has already either agreed with his farmer and miller tenants to do so, or has contracted himself to effect these repairs for them. He should also be required to abstain on behalf of himself, his agents or tenants, from boating on the water or from any act which would tend to prejudicially affect the fishing rights he has let.

The usual lessor's covenants should follow as to peaceable possession so long as the rent is paid and the conditions of the lease duly observed, with the usual provisos as to recovery of rent and re-entry if necessary.

CHAPTER III.

MANAGEMENT.

Superintendence.

IF the water has been taken by the lessee with the intention of keeping it entirely in his own hands, for his own sport and that of his personal friends exclusively, he should superintend all matters connected with it himself. If it is taken as a commercial speculation, I can offer no advice, having always held that sport and profit cannot be united in one undertaking without one destroying, or at best seriously crippling, the other. If the intention is to make a club, or for two or more friends to carry on the fishery and divide the expenses among them, their first step should be to select one of their number to superintend the fishery.

This position is by no means an invidious one, and anyone taking it will find it no sinecure. He must have leisure to attend to the multifarious duties of the office. He should

have some knowledge of book-keeping, and be systematic and precise in his work. Tact, good temper, and boundless patience are required in his dealings with lawyers, agents, keepers, farmers, and labourers. Above all, however, he must be keen for the work, or he cannot hope to succeed. The other members must be prepared to give him a free hand in all matters of detail, and even if they differ from his views in respect to important questions, they should try and meet him halfway if they cannot give in to him altogether. He, however, must never forget that he is, in a measure, a trustee, acting in the interests as well as the names of his brother members, wasting their money as well as his own if he is reckless, and subjecting them, in a degree, to the same loss of popularity as himself if he is too niggardly. Whenever he is in doubt on a question, and cannot decide on the best course, he had better at once consult some, if not all, of his *confrères*, and when consulting them he must be prepared to follow their advice, and not feel aggrieved at their differing from him. Too often, when men ask advice, they have decided on the course to adopt; or, as a witty friend pithily remarked to me on this subject, when men seek counsel of their friends, as a rule, "they do not want advice, but indorsement."

Rules and regulations.

A set of written or printed rules should be drawn up and agreed upon among the members of the fishery. Even if only two or three friends join in taking water, it is better to do so, as it saves endless friction and discussion. Besides, if the men who are defraying the cost are contented to enforce certain regulations among themselves, their guests or friends fishing with them cannot complain at being subject to the same rules. Another reason for having this written or printed set of rules is, that there is some difficulty in bringing them under the notice of guests in any other form. The essential conditions required in the regulations of a fishery are not very numerous. The following copy of the rules in force on a water leased by four fishermen, who allow only legitimate fly-fishing, is given as an example:—

RULES.

SEASON.

Trout fishing from 1st April to 30th September.
Grayling fishing from 1st August to 31st December.

LIMITS.

Size.—No Trout or Grayling to be killed under 13 inches in length. Any under this length to be at once carefully returned to the water.

Number.—Not more than Two Brace of fish to be killed in any day.

BAIT.

Artificial fly only to be used. Alexandra and other silver-bodied or Salmon Flies prohibited.

FISH OUT OF CONDITION.

It is requested that all ill-conditioned Trout landed before 1st June be returned to the water.

Fishermen are earnestly requested to close all gates and abstain from damaging fences, banks, or standing crops in the meadows.

The details of season, limits, &c., can of course be varied according to the condition of the stock in the river and the views of the lessees, but these rules give briefly the outline of what is requisite.

Returning undersized fish.

In reference to the policy of returning undersized trout and grayling to the water, a theory has been promulgated of late years that the increasing shyness of the fish is due in a great measure to the almost universal adoption of this rule. That the effect of continually landing and returning the young trout will tend to lessen the freedom with which they rise to the fly is, to a certain extent, a sound argument. At the same time, it is an eminently dangerous theory to put into practice, and a few moments' consideration of the probable results would, I think, convince all true anglers of the necessity of adhering to this regulation. Of course for the pot-hunters and those whose object is to establish records of the number killed, it would be a great boon to be allowed to kill and keep every 4oz. trout that they could delude. It must also be taken

into consideration that there are among the best fishermen few, if any, who can invariably be certain that a feeding fish is takeable. Even granted that a past master can be sure of this, and will abstain from casting over any he may think unsizeable, how often will some wretched little yearling or two-year-old seize the fly before it has reached the rising trout for which it was intended? I fear the result of abrogating the customary rule of returning undersized fish would be to deplete a stream of the store fish, and in a few seasons reduce the river to a deplorable state. It may be laid down, that if out of three fish landed the angler can keep one and has to return two to the water, the limit of size imposed may be deemed a fair one.

Records of fish taken, &c.

Accurate records should be kept of the trout taken by the fishermen and their friends, as well as full lists of all pike and other coarse fish killed, and of stocking. For the purpose of bringing all material questions before the members, a report should be drawn up at the end of each year, submitted either to a meeting or to each of the members for approval, and kept in a book accessible to all of them. Such report should comprise the following:—A *resumé* of the accounts, with remarks on any items where the expenditure seems excessive, and where possible an explanation of the causes

of such excessive expenditure. An approximate estimate of the probable expenses for the next season, and, if necessary, an intimation as to the date or dates when the members' subscriptions should be paid. The statistics of killing down coarse fish, of stocking, and of any other matters of interest should be given *in extenso.*

A detailed statement and analysis of receipts and expenditure properly drawn up and audited should accompany the report. I would strenuously impress on all engaged in such work that a separate banking account should be opened for any fishery which consists of two or more members, and that all cash received should be paid to such account, and all expenditure defrayed out of it. Many men will say that it is not worth the trouble, and prefer passing the items through their own banking accounts. I warn them that they will regret taking such a course. Either they will find themselves a considerable sum out of pocket at the end of the year, or they will be unable to balance their accounts. Besides, too, let them consider how unpleasant their position would be if one of their brother members, or in case of his death his executors, should require a proper account and vouchers; and, in the case of executors, I fear it would be their duty to call for such accounts.

Keepers.

Before possession is given to the lessees, the question of keeper or keepers will have to be considered by them, unless it be one of the lessor's covenants in the lease. If the number of keepers is not defined in the lease, it should be decided by the members. The extent of the water, its distance from the villages in which quarters would have to be found, as well as their prevailing views on the question of cost, will all have to be duly weighed. For their guidance, they may take it that, provided there are no extraordinary difficulties in getting from one part of the fishery to another, that the keeper is not expected to carry anglers' baskets or attend on them when fishing, and that all such work as weed-cutting and netting is done by labourers engaged for the purpose, a thoroughly active strong man can look after something like two miles of water. Under the same conditions two keepers, *i.e.*, a head keeper and an assistant working under him, can easily manage six or seven miles if the keepers' cottages are near the river and two or three miles apart.

Whether it is decided to have only one keeper or to work with two or more, the first point to ascertain is whether there are local men fit for the post. If so they should be taken on temporarily, and, if found suitable, be permanently engaged. If, however, there should

be no local men, and one's intimate friends cannot recommend anyone for the post of head keeper, the only resource open is to advertise. As a rule such an advertisement in the sporting press will bring hundreds of answers from all parts of the country. The majority will be from gamekeepers out of place, or second keepers on large estates wishing to improve their position. They will inclose numerous testimonials from their late or present employers certifying that they have full knowledge of the art of pheasant rearing, and are learned in the mysteries of trapping vermin. Some will emanate from pensioned soldiers or policemen, men no doubt of good character but absolutely ignorant of the work of a river keeper. Some will profess to know all about the subject, because in their beat on Lord ——'s estate there was a salmon pool or a stream, containing a few 3oz. trout. Some can, or say they can, dress salmon flies, and others, again, have gained their experience as Thames or Trent fishermen, and know how to bait a barbel swim, or make a gudgeon spin truly on a flight of hooks.

Some of the answers may come from old chalk stream keepers who are known to one or more of the members as incompetent, lazy, drunken scoundrels. As a warning to my

readers I would instance a case which occurred to me in which an old keeper on a club water I had fished myself, who had been discharged for drunkenness, and was more than suspected of dishonesty, not only applied for the situation but inclosed a copy of a testimonial from the son of his late employer (how obtained is a mystery), presumably in the hope that the surname being the same the difference in the initials might be overlooked. Perhaps some friend or acquaintance reading the advertisement may recommend a man, and sometimes a keeper taken from such recommendation may turn out well. Altogether the selection of a man for such work is most difficult and haphazard. Some advise that no local man should be taken, some go farther and say that a Scotchman or Yorkshireman is worth at least four of the local south country rustics; and, without wishing to run down the Hampshire or Wiltshire men, certainly of the two best and most reliable keepers I have known, one is a native of Yorkshire and the other hails from the Land o' Cakes.

If a second or under keeper is required it is as a rule far better to try and find a man of good character in the nearest village. He must, however, be civil, obliging, take an interest in his work, and on the score of honesty and

sobriety be without reproach. If the head keeper is a thoroughly good one he will soon find out whether the local under keeper will suit. It is always well to take on either of the keepers temporarily for some few months before letting him consider it a permanent situation. Wages on a moderately liberal scale should be paid, and if men give satisfaction it is, as a rule, better policy to raise their wages at the end of the first year or so rather than wait for them to ask for the increase.

Planks and stiles, &c.

One of the earliest steps necessary is for the superintendent of the fishery to devote some time to a careful survey of the water in company with the newly appointed head keeper. Such time will certainly not be wasted, as it will not only serve to make both master and man thoroughly acquainted with every turn and twist of the river, but at the same time give the master many opportunities of gauging the capacity and intelligence of the keeper. Such preliminary survey can well be utilised in seeing that both banks throughout the water are approachable, and that whether for the purpose of weed-cutting, netting, wiring, trimmering, and last, but certainly not least, for the fishing itself, it is possible to get moderately near the margin of the river.

In a chalk stream bounded by water-meadows

there are at right angles to the course of the river a number of irrigation cuts or carriers varying from a few inches in width to as much as twenty or thirty feet, and in the case of all but the very narrowest it is desirable that proper planks should be provided. These should be set at a distance of from twelve to fifteen feet from the bank, so that while it should be possible to walk up the stream without scaring every fish, yet they should not be so far removed from the river as to handicap the fisherman too severely when walking down with a hooked fish. Some freeholders, or their agents or tenants, assert that it is the fishing lessee's business to provide and maintain these planks, and a more untenable proposition it is barely possible to advance. It must be remembered that every right of fishing conveys with it a right of way, and that for each time the keepers or fishermen cross these planks the farmers and their labourers use them twenty times. It must be remembered, too, that the effect of placing these planks is that everyone, whether fisherman, keeper, farmer, labourer, or trespasser, walks along the same track, so that only a small quantity of the pasture is injured, while, if no planks are supplied, each one takes a course according to his own fancy, and a considerable width of herbage is more or less

injured. For the same reasons it is desirable to have stiles provided over all hedges and fences placed in the line of the planks.

Hatches in water meadows.

Wherever there are water-meadows on the banks of a stream, hatches leading from the main river into the various irrigation cuts and carriers, as well as other hatches in these carriers themselves, are provided for the purpose of being able to regulate the watering of the meadows, *i.e.*, either covering them with water or keeping them dry according to the requirements of the farmers from time to time. It is desirable for the fisherman, and essential for the farmer, that these hatches should be kept in proper repair, and fortunately there is no difference of opinion as to the expense of repairs to or renewals of hatches, being a matter entirely outside the limits of the fishing lessee's responsibilities.

Usually a number of farmers employ the same man or set of men to regulate these hatches, and pay them by a fixed annual contribution, rateably according to the acreage of water-meadow comprised in each farm. On the Kennet these men are called *floaters*, and, strange to say, on the Test and Itchen, *drowners*, and they are held responsible for any damage accruing to crops through negligent or improper raising or lowering of the hatches. A

good keeper is invariably on friendly terms with these floaters, and hence gets timely intimation of any prospective alterations of the water level necessitated by the working of the meadows. An indifferent keeper who neglects these points will during the season lose a considerable number of his fish owing to their being left in the dry ditches when the water is turned out of a meadow. Even if the water is not entirely drawn off, and the trout can find refuge in deeper parts of the carriers, they are not likely to get into condition when thus penned up in places where there is no flow of water, besides, under such conditions, being an easy prey to poachers.

Banks, &c.

As previously stated in the chapter on "Tenure," the keeping in good repair of all banks of the river, or any tributaries, backwaters, ditches, and carriers should invariably be an obligation on the freeholder. This clause is, however, a somewhat elastic one, as what might be considered by the freeholder, and even upheld at law, as a reasonable state of repair for the banks of the stream, may not be deemed sufficient by the fishing tenant, and this is one of the reasons for the necessity of the stipulation in the lease that the lessee should have the right to do any work deemed necessary by him for the improvement of the

fishery. Of course this right must be exercised with discretion, and in such manner as not to damage the freeholder or his tenants or others owning or leasing land on the banks of the stream. It is often good policy for the fishing tenant to let his keepers carry out any small amount of work required to repair a small breach or weak place in the banks. For such purpose a few old hurdles are serviceable, and most agents are grateful to a tenant if he points these matters out, and will generally place at his disposal for this purpose some of the old hurdles lying about the estate. Over a swampy place or a shaky sedge bed a line of hurdles two or three deep are laid and pegged in place and a few sods of turf or mud dragged from the river laid on them. As they sink fresh turf or mud, if necessary, is piled up until in a few seasons a firm path is made along the bank in places where previously the water could not be approached.

Removal of mud.

The lessee's right to remove mud or shoal or do other work he may consider of advantage to the fishery is an important one, and, as before remarked, must be used with discretion. In deep, slow-running reaches mud will always be deposited in a greater or less quantity; in some parts close to the banks, and in others in mid-stream, and wherever this occurs the

advisability of removing it or not should be considered.

It may be laid down as an axiom that the less mud there is the better will be the condition and appearance of the fish. It must also be remembered that the larvæ of such flies as the Alder and the Mayfly require a deposit of light-coloured, sandy mud in which to burrow. The foul, black malodorous mud found in rivers polluted with sewage, or where great quantities of leaves falling from trees decompose, is of no use whatever in the river, and, theoretically, every particle of it should be removed. It would, however, probably surprise anyone unaccustomed to this class of work to see the actual cost of taking out such deposits, and hence the problem is to keep the bed of the stream as free as possible from this filth without incurring an expenditure out of all proportion to the results attained. In any case such work should be executed during the winter, when there is little or no occupation for the farm labourers, and they would, as a rule, only be too glad of an opportunity to earn small wages in place of being reduced to a state of compulsory idleness and consequent distress. Much of the poaching among villagers is practised during this part of the year, and a judicious expenditure in cleaning the river will at times do away with

this poaching altogether, or at least reduce it to a minimum.

An efficacious plan adopted on the Upper Test is to fix a line of hurdles by posts firmly driven into the bed of the stream across the river from bank to bank. The top of these hurdles is just above the water level, and wherever one or more of them is taken out there the full force of the stream will flow and wash away any soft mud on the gravel. By shifting and replacing hurdles in this way the entire width of the stream can be cleaned during a series of winter floods. It must, however, be remembered that this mud is not removed, but shifted to one's neighbours below, who may object, or even bring an action for damages.

CHAPTER IV.

WEEDS.

Weeds as affecting food supply.

THE proper management of the weeds in the river is so important a question that no apology is necessary for devoting an entire chapter to the consideration of the subject. Under the heading of "Selection," attention has already been directed to the fact that the food supply is largely dependent on the presence of the weeds on which the shrimps, snails, caddis, and other larvæ habitually live. Obviously, the size and condition of the fish being dependent on the food supply, it may be taken for granted that the more abundant the crop of suitable weeds in any stream, the greater will be the probability of a plentiful stock of well-grown and large trout and grayling. On the comparative suitability of various species of aquatic plants, I have treated briefly in a previous chapter. Every effort should be made to encourage

the growth of the most suitable genera, and no opportunity should be neglected of thinning out or extirpating those which are too gross of growth or in other ways unfavourable to the development of the forms of animal life which constitute in so great a degree the nutriment of the *Salmonidæ*.

Weeds as shelter.

The presence of weeds is necessary for other purposes besides the question of food supply. In hot weather fish, like human beings, instinctively seek shade during the long hours of daylight, and except when feeding are usually buried in the luxuriant growth, possibly indulging in a *siesta*. Every time a trout or grayling is scared, it seeks refuge in the nearest weed bed, and the effect of mowing down wholesale all vegetation in a stream is to increase their shyness until at length they become quite unapproachable. All these arguments point to the desirability of having plenty of weeds in the river. On the other hand, the greater the quantity of weeds, the greater will be the number of shrimps, snails, and caddis, and other larvæ, and although, of course, the flies constituting the surface food come from the caddis and other aquatic larvæ, yet an excessive supply of the shrimps, snails, &c., will infallibly induce the fish to feed more at the bottom and in mid-water and less on the surface. The presence

of dense masses of weed will also assist many hooked fish in escaping, but knowledge of the best method of handling hooked fish among weeds will, to a certain degree, enable the angler to overcome this difficulty. It may be inferred from the foregoing that the *crux* of successful management is to arrive at a happy medium between the drastic method of shaving close, thus destroying the food of the fish and rendering them abnormally shy, and the *laisser aller* policy of leaving the river overgrown with heavy beds of weed, and rendering it unfishable. In the case of the rapid streams of the north, where the weeds are usually more or less *conspicuous by their absence,* anything like systematic cutting is needless. When dealing, however, with south-country chalk streams, where there is naturally a superabundance of vegetable growth, the degree to which, and times at which the weeds should be cut, is a question requiring patient and intelligent study.

Weed cutting by the lessor.

Where water is let by the season the weed cutting is usually undertaken by the lessor. Such, at least, is the theory; but in practice he generally shirks the greater part of this responsibility. If there are mills on the property he relies on the knowledge that the miller must, in his own interest, cut the weeds when their growth and luxuriance exceed a certain point, to

keep his head of water above and to get rid of the tail water below his wheel. The usual policy of the lessor and miller is to do nothing until the stream is almost choked up by their growth, and then put on a few men to run chain scythes rapidly down the river and make a clean sweep of them altogether. The result of this treatment is, that during the latter part of the spring a considerable portion of the water is unfishable, and in the hot weather, when the protection of the weeds is of the greatest advantage to both fish and fishermen, every particle has been swept away. The general idea of the lessor when undertaking weed-cutting is to get an increased rent in consideration of this expense being spared to the lessee, and his policy then is to put this extra rent into his pocket instead of expending it on the work he has contracted to do. Although indefensible from a moral point of view, yet tactically it is occasionally good policy for the tenant, under such circumstances, to offer to pay for the labour of weed-cutting; he will then secure the control of the question, subject, of course, to the rights of millers or other riparian occupiers.

Weed cutting by the lessee.

On the assumption that it is a covenant of the tenant under his lease or agreement to cut the weeds, or that he has voluntarily undertaken this duty as suggested in the last para-

graph, he must proceed to consider the plan of campaign. In dealing with this question, it must be premised that efficiency is regarded here in preference to mere economy, and hence, if it is necessary to keep the expenditure down to a minimum, the scheme suggested must be modified in detail. Provided the weeds had been properly cut in the previous autumn, or after a severe winter has effectually caused them to rot away, a chalk stream in the early spring will be found to err, if anything, on the side of being too bare. At the opening of the fishing season, when the trout are comparatively unsophisticated, the absence of weed on the shallows and deeps is not a matter of any moment. In genial weather, especially if accompanied by frequent warm showers alternating with intervals of sunshine, the growth of all aquatic vegetation increases rapidly, so that by the end of April or early part of May the first cutting of the weeds must be undertaken.

Spring weed cutting.

In the spring cutting the desideratum is to leave sufficient weeds to give adequate shelter to the trout, and yet not too much for the peace of mind of the fisherman. If there is any doubt as to what is the *juste milieu*, it is preferable to lean to the policy of leaving too much rather than too little, and, profiting by past experience, correct this error in subse-

quent seasons. The main object is to render the state of the river as favourable as possible for sport. The general character of south-country rivers is that the reaches are comprised under one of three categories, viz.: shallows, mill ponds, or hatch holes. The shallows are usually broad and fast-running as compared with the other parts of the stream, and the bed of the river is gravel more or less covered with mud and weeds. The mill ponds are of moderate depth, the stream rather sluggish, and the bottom muddy. The hatch holes are deep, swirling, eddying holes, and the force of the stream has usually thrown up a bar of gravel at their lower ends, over which the depth of water is very small. The principles on which the weeds should be cut must be separately considered in each case.

Treatment of shallows.

The ova are hatched, and the helpless alevins lie in the shallow water until the yolk sac is absorbed. The fry then make their way to the thinnest water in the immediate vicinity, and remain there during the early portion of their lives. The more plentiful the supply of young shrimps, snails, and immature larvæ, the longer they are disposed to inhabit these portions of the river. The parent fish, after spawning, take up their positions on the shallows, in comparatively slack water, behind boulders or beds of

weeds; and if the quantity of natural food is plentiful, and the surroundings are not such as to lead to their being scared away, they speedily recover their condition. Any paucity of food is supplemented by cannibalistic raids on their own or their neighbours' offspring; and when these means of satisfying appetite are exhausted, they make the best of their way to deeper parts of the river, which are more prolific of animal life. Hence it is desirable that all available means of keeping up the food supply should be encouraged, as well for the protection of the fry as for the improvement in the condition of the adult fish. In the due apportionment of a shallow in weeds and gravel, these points should be borne in mind, as well as the necessity for slack places below patches of weeds or other obstructions, where feeding fish can rest without great exertion. The absence of such places, which is the result of wholesale clearing away of all weeds, will infallibly result in the migration of the larger trout to quieter and more favourable water.

The side-and-bar system.

Many plans have been tried of arranging the weeds on a shallow so as to carry out this idea, but so far none known to me has proved so successful as the *side-and-bar* system. This system consists of leaving on the shallows, across the river from bank to bank, bars of

uncut weed alternately with bars of clean bright gravel. The width of the bars of weed should in no case exceed, say, ten yards, and of the intervening gravel, from ten to fifteen yards. Each portion of each shallow, however, requires special study and special arrangement.

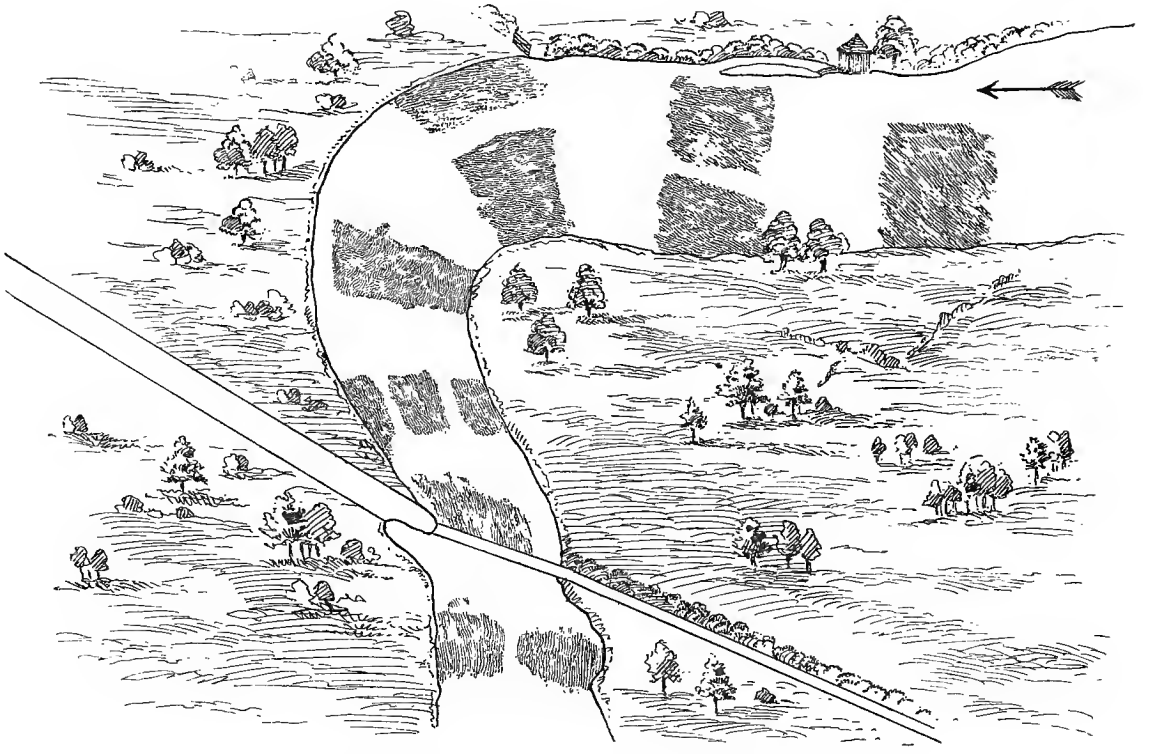
For example, in any shallow from which in dry summers the water runs off so much as to render it too thin for successful fishing, it is essential to leave dense bars of weed, especially at the lower end, so as to retard the flow of the water. Where the growth of the weeds is usually very luxuriant, it is well to contract the width of the bars of weed and expand the breadth of the bars of gravel. The setting out of these alternate bars of weed and gravel should be carefully planned out beforehand, so that every advantage is taken of the natural set of the stream to provide favourable resting places and feeding places for the fish.

If, when the shallow is cut in bars, it should be found that the stream is penned back too much, narrow longitudinal runs cut here and there through the weed bars, or at the sides, will let the water down. When setting out these runs, it is well to arrange them in alternate weed bars on either side of the stream, and in case the flow of water is still too much impeded, to cut similar runs down the

middle of the stream. A judicious application of this principle can be used to divert the current towards any spot desired for moving small accumulations of mud, or other purposes deemed of advantage to the particular part of the river. With the view of showing clearly how this system should be carried out, the accompanying plate of a portion of the famous Sheepbridge Shallow at Houghton-on-the-Test, showing the ordinary appearance of the shallow if treated on this principle, is appended.

When it is intended to carry out the side-and-bar system of spring weed-cutting, the positions of the weed bars should be carefully marked by stakes driven into the banks, and in arranging them due regard should be paid to the character of the weeds in the various portions of the shallow. Thus, as far as possible, natural beds of celery should be left, and masses of carrot or ribbon weed be cut out to form beds of gravel. Places where trout habitually feed on floating insects should, as far as possible, be set out as gravel beds, and weed beds left where practicable above points where the mud usually accumulates, so that the rush of water should invariably tend to remove such deposits.

When the entire shallow has been distinctly marked out, the gravel beds should be cut out by men working in the water with hand scythes,



THE SIDE AND BAR SYSTEM OF WEED CUTTING.

and it must be impressed upon them that the success or non-success of the plan depends in a great measure on the work being done accurately to the marks, and where the weeds are removed they must be taught to cut them away close down to the gravel. Any longitudinal runs or sidings required must be set out and cut some time after the general spring cutting has been completed, so as to be certain of their necessity. If, after all the work is done, parts of the gravel are found to be covered by mud, they should be thoroughly raked over with heavy metal rakes.

Treatment of mill ponds.

On mill ponds or reaches of similar character, where the water is of moderate depth and the current comparatively slight, one of the two following systems of cutting the weeds in the Spring should be adopted. Where the growth of weed is very rapid the whole of the weed should be cut out from bank to bank. The most efficacious and economical mode of effecting this is by a chain scythe worked up stream, which cuts all the central portion of the stream. Two men following, one on either side, trim out closely the bank and part adjacent to it with hand scythes.

A chain scythe is made by bolting together a number of blunt-ended scythe blades. A chain or rope is fixed to each end, and

the men—two on each bank—as they move slowly up stream, work the chain scythe backwards and forwards with a sawing motion. The men must not be allowed to hurry over this work, as undue speed will only result in the weeds not being cut close to the bed of the river and probably the work having to be done again in the space of a month or so. Where, however, the growth of weeds is only moderate, a man on each side with a long-handled scythe can cut out a wide, clear run or siding under either bank, and the chain scythe worked somewhat quickly down stream will top the remainder of the weeds sufficiently to silence the grumbling of millers and others.

Treatment of hatch holes.

As a rule weeds do not flourish in the deepest parts of hatch holes or mill pools, but wherever there is in such water anything like masses of vegetation they should be cut as closely as possible. It is, however, well to leave as much weed as possible on any shallow gravel bars below the hatch holes as tending to keep the water level up during a dry summer, or when the hatches supplying it are tightly closed. As a rule the dry-fly purist has no particular affection for this class of water, although, under favourable conditions, the largest and gamest fish occasionally rise well, and, what is perhaps more important, take well, in some hatch holes.

Trimming weeds in deep water.

In a chalk stream the weeds grow rapidly during the summer season, and from time to time the necessity arises for dealing with them so as to prevent the water from being choked up. This work of trimming during the summer and early autumn should be done by the keepers, the more so as it requires judgment and tact to decide the extent to which, and the time at which, it should be carried out in each reach. The cutting in the mill ponds or other deep stretches can be effectually done from the banks with ordinary hand scythes set on extra long straight handles. The lightest and most convenient are made of stout bamboos, which can be purchased up to 18 or 20 feet in length at moderate cost; failing these, a long thin larch makes a good substitute.

The rushes standing at the margin of the river should not be cut, as they afford a protection to the fish and serve in a degree to assist the angler in keeping out of sight. The keepers, however, should cut out the weeds as closely as possible for a width of say three yards from either bank, and the edges of the banks themselves should be kept clear of weeds or partially submerged rushes. If this plan is carried out there will be a clear run under either bank, in which the majority of rising fish will be found. The vegetation in the central portion of the

reach will very possibly show on or above the surface of the water, and look untidy. This, however, need not affect the fisherman, as during the hot weather it will improve his prospect of sport, not only because the level of the water is better kept up, but also because the fish will be less shy and rise more freely than they would if all the weeds had been mowed down after the fashion most approved by the old school of keepers.

Trimming weeds on shallows.

As to the shallows, each has to be considered by itself. In every case, however, it is well for the keepers to go in and cut out all those parts of the gravel bars, as made in the spring cutting, which have become overgrown with weeds, and, if at all fouled by mud, to give the gravel a good raking. On a narrow shallow where the water is not very thin, the plan of cutting out a run under each bank is, perhaps, most efficacious, but where there is a very sharp fall, or where the water requires backing up, a run on one bank only, or runs through the weed beds on alternate sides, should be cut.

Occasionally an extra dense bed should be raked out by the roots, so as to leave a clear, sharp gravel patch, which will certainly be taken as a favourable feeding place by a good fish. Sometimes the weed is so high as to require generally topping with the hand scythe. A

constant source of annoyance on some shallows is the presence of scattered chair rushes—so called because rush-bottomed chairs are made with them. Where these are present they catch the fly, causing it to drag, besides being very tough when hooked. They should be summarily dealt with by being pulled out by the roots.

All these operations should be carried out by an intelligent keeper, and done at times when there are no fishermen either in the length he is cutting or on the reaches immediately below it. Early morning is the most convenient time, and the danger to be guarded against is that of doing too much. If runs are to be cut, the effect of very narrow ones should first be tried, and if, after a few days, they are found insufficient, there is no difficulty in cutting them to an additional width. Once, however, overdo the cutting, and the water is spoilt for the angler until the weeds have grown up again.

Autumn weed cutting.

At the end of the trout season, the growth of weeds in the river is likely to be so luxuriant as to seriously retard the flow of water. Even if a thorough cutting was not required for the benefit of the stream itself, loud complaints would be heard from the farmers at the prospect of their land being flooded in the winter.

The desire of the millers to work longer hours, and secure some little extra profit out of the demand for flour from the new wheat just harvested, would impel them to clamour for a better supply of water. The pressure brought to bear simultaneously from these two quarters would of itself induce the fisherman to try and assist them; that is, provided he desired, as he should, to be on friendly terms with his neighbours. It is, however, no less important for the future sport of the angler than for the pocket of the miller and the peace of mind of the farmer, that the weeds should be cut at this time of the year.

Notably it is required for three reasons. Firstly, because, if left to rot in the river, the decomposed vegetable matter will increase the quantity of foul mud which has always a tendency to accumulate in the stiller and deeper reaches. Secondly, because the gravel on the shallows, whether of the main stream, tributaries, or even carriers, can scarcely be too bare or too clean and sharp for the ova when deposited by the gravid female to hatch out successfully; in fact, the presence of an undue proportion of weed on a natural spawning bed will often prevent the fish from spawning on it at all. Thirdly, because, however closely the river may have been netted in the spring, and

however zealously keepers may have plied the wire and set trimmers during the summer, it may be predicted that some pike will have made their unwelcome presence seen; the water should therefore be again netted in the autumn, and to net effectually the weeds must be cut closely.

The details of the spring weed cutting and of the trimming during the trout season require thought and judgment, and they are operations in the design and execution of which due consideration must be given to a variety of circumstances. Whoever is responsible for the management of the fishery should have studied the question as a whole, and have applied his knowledge to the particular stretch of water with which he is dealing. The anglers' sport during the season will, in a measure, depend on the degree of intelligence with which the original scheme has been devised, and the care with which it has been carried out. If the sport is good, the appreciation of his brother fishermen will be the reward of the manager; and if bad, their criticism, possibly more candid than palatable, will be his punishment. In the autumn cutting, however, the case is quite different. No careful arrangement of side and bar on the shallows nor siding of the deeps will be required. All that has to be done is to cut the weeds close

to the bed of the river from bank to bank, from the top of the water to the lowest boundary, and in every tributary, carrier, and ditch. Much of this can be done effectually by the chain scythe, and it is more economical to employ a sufficient number of labourers and get the work finished off at once than to have one or two men pottering about for months and making the job last as long as possible.

Cut weeds.

When the weeds have been cut, the question will arise as to what is to be done with the masses of floating vegetation which accumulate at the hatches and cover a considerable distance of the water above them. The usual custom is to open the hatches wide and let them drift down with the current, some lodging on or against any obstruction with which they may be brought in contact, some being carried by the flow of the water into stagnant places where they remain, or into eddies where they are kept slowly gyrating until carried away by a rise of water, and the remainder gradually finding their way down to the next set of hatches in the river. Meanwhile all these weeds are gradually decaying, polluting the air, poisoning the water, and filling the slow deep portions of the river with foul-smelling mud, the ultimate solid residuum of decomposed vegetable matter.

By the judicious use of drags and alternate raising and lowering of hatches, they are, in time, passed down to the next water below; then, with the addition of the weeds cut on this next water, passed on and on in ever increasing bulk, until eventually the unfortunate proprietor of water many miles below has to deal with an enormous accumulation of many thousands of tons of malodorous partially decayed vegetation.

Annoyance from cut weeds.

If, too, he has the misfortune to be on a tributary of the Thames and within the limit of distance over which the Thames Conservancy has jurisdiction, he is prohibited under severe penalties from sending these weeds further down. If, by any extraordinary circumstance, officials have been successfully roused from their general lethargic condition, it is quite possible that they will try and force this unlucky individual to drag the huge heap of weeds out of the river at his own expense and turn them on to the adjoining meadows. It is, of course, a monstrous and most inequitable charge to be imposed upon him, and whether he has a legal remedy or not, morally, he certainly has a grave cause of complaint at the unfair and unneighbourly action of those who have sent the weeds down.

Looking at the question from a common sense point of view, he ought to be able to prevent this course of conduct on the part of the

Legal aspect of the question.

proprietors immediately above him, and they in turn ought to have a remedy against the proprietors above them. It is said by some members of the legal profession that the plea of custom would be successfully raised as a defence against an action brought on these grounds. No doubt, proving the custom, which would not be difficult, would impose difficulties, but, although law and justice do not always go hand in hand, it does not seem likely that any judge would indorse so monstrous a proposition as that proving the custom of dealing with the cut weeds in an unjust or illegal manner should render such dealing just or legal.

The following principles appear to be clearly settled when dealing with this question, as laid down in "Addison on Torts:"—

"If a riparian proprietor higher up a stream throws dirt or refuse into it, so as to defile the water, and render it unfit for use, to the damage of another riparian proprietor who has been in the habit of using the water, an action is maintainable for the injury."

And further,

"Every person who throws dirt or rubbish into a stream so as to defile the water, and prevent the riparian proprietors and others from having the beneficial use of the water they have been accustomed to, is guilty of a nuisance, and may be made responsible in damages."

These principles, however, seem confined to cases where the source of pollution was extra-

neous, *i.e.*, created or brought by the pollution to his premises.

Gilbey *v.* Wiggins, Teape and Co., Limited.

The case of Gilbey *v.* Wiggins, Teape, and Co., Limited, carried these principles one step further, and the thanks of all true sportsmen are due to Mr. Alfred Gilbey for the public spirit displayed by him in fighting the action. In this case nothing extraneous or artificial was the source of the mischief. The mill was shut down for about five months, and during that time a quantity of mud accumulated in the mill head. Later on, the occupier being desirous of working the mill, the weeds were cut in the mill head, and for the purpose of carrying away these cut weeds and the accumulated mud the ground gates were lifted. The result of this was that the mud was suddenly and in a body carried down the stream, so as to pollute the water and destroy the fish.

The source of mischief, as will have been observed, was here the accumulation to an abnormal extent of the mud and sediment brought down in suspension by the natural flow of the water, and lodged in the mill head. The real principle seems now to be contained in the following sentence, for which I am indebted to my learned friend, Mr. W. Pingo Horton:—

"Though a riparian owner has, subject to the corresponding rights of his fellow riparian owners, the right to

the use of the water as it passes his land, he has (unless he has acquired a prescriptive right as against them to do so) no right to prejudicially affect the condition of the water so as to sensibly injure other riparian owners, whether above or below him."

In the judge's opinion it was not necessary that the pollution and consequent damage should be caused by the introduction of some extraneous subject, but the presence of an excessive accumulation of mud by the defendant's predecessors did not justify them lifting their flood hatches, and so allowing it to be carried down by the flow of water to the plaintiff's stream below.

Judge Holl, Q.C., in giving judgment for the plaintiff, said :

"Under those circumstances they ought to have mud-panned it ; at any rate they ought not to have taken a course which led to the mud being suddenly and in a body carried down the stream, so as to pollute the water and destroy the fish."

It would appear that if a riparian owner is bound to remove an excessive accumulation of mud, and not send it down to the water below, the same principle would apply to an excessive accumulation of cut weeds, or of any other substance calculated to injure other riparian owners in the event of its escaping.

Disposal of the weeds.

Granted, however, that this passing down of

cut weeds is illegal, what is the lessee or proprietor of a stretch of water to do with them? It is said that, turned on to the land and left to rot, they would form a valuable fertilising agent, but on this point there are differences of opinion. It seems, however, to be generally admitted that if mixed with lime they would be of advantage to the land. Some farmers state that, so far from the rotten or decomposed weeds being a beneficial form of manure, the effect of turning them on to the land is to kill the grass, and that it takes many years for a meadow to recover from the injury thus caused. A well-considered opinion from a recognised authority on the subject would be of the greatest use.

If it were once established that each proprietor is bound to remove from the river his own cut weeds, what is to be done with the cabbage leaves, lawn mowings, and other garden refuse which is usually swept into the river from every house or cottage on the bank? It is said that the sanitary authorities have the power of preventing this, and if only they could be induced, or compelled, to use their power and to select, in the first instance, the largest and most influential riparian owners, there might be some hopes of improvement. It might not only remove the unjust burden now thrown on pro-

prietors and lessees of fisheries, but, in time, the continual fouling of the water with the mud deposited during the gradual decomposition of the floating weeds would be diminished and one cause of river pollution removed.

In the case of a fishery where the details of management were somewhat under my own control, it was decided by the lessees that, whatever might be the legal aspect of the question, and however great the expense, all cut weeds should be removed from the river, and not sent drifting down to our neighbours with a view of shifting on to their shoulders responsibilities which certainly morally, and probably legally, should devolve upon us. This having been decided, the next step was to make arrangements for their disposal on land adjoining the stream. Inquiry among the farmers elicited the fact that no one of them would go to the expense of pulling out the weeds in consideration of the benefit to accrue from their use as manure. In the entire length of the water only one tenant cared to carry them at his own expense from the banks after we had deposited them there, and use them in his garden. A portion of the cut weeds was accordingly landed on the bank close to his garden, and this he carried away.

Permission was obtained to heap up the

remainder on a piece of waste land alongside the stream. At the expiration of twelve months the resulting mould was carted down to a garden in the village. The gardener there, and all practical men who have inspected it, pronounce it to be as good a lot of garden mould as could be obtained, and predict that the show of bloom and crop of vegetables in that garden next summer will astonish the natives. If so, it may be anticipated that there will be an active demand for cut weeds in future seasons for other gardens in the vicinity.

Drifting weeds while fishing.

There is no more frequent cause of annoyance to fly fishermen than cut weeds drifting down. How often one's favourite reach is rendered impossible by the action of some thoughtless keeper sending his cut weeds down just at the time the trout are rising! Perhaps all day the patient angler has watched and waited in vain, and just in the cool of the evening, simultaneously with the first appearance of the fly on the water and the first shy movement of the fish, a few patches of bright green, freshly cut weeds are seen slowly approaching. Perhaps the fisherman waits on, hoping against hope, only to find that instead of small straggling patches, it comes no longer "single spies, but in battalions." Perhaps he walks miles up-stream and finds the keeper of the water above

him busily engaged in pushing the weeds through a hatch, and, as likely as not, he is met by a point blank refusal or even impertinent answer when he asks that the nuisance should be stopped for a few hours.

One is often asked how to remedy this. The best plan, if both banks are rented by the lessee, is to construct a good solid weed rack across the water at the upper boundary. This will stop the heavy masses of weed, and in time compel the proprietor above to take them out. If this is impracticable, and in any case as a valuable adjunct, the weed net can be used. It is a heavy large meshed one, such as bullock netting, three or four feet deep, well leaded at the lower side, and long enough to stretch across the river with a pronounced bow. It is placed at any point where the stream is not too rapid, and attached to strong posts on either bank. At first the heavy masses only are stopped by it, but in time as they accumulate and form a solid barrier on the surface, every particle of drifting weed is effectually prevented from passing through. If at any time the strain should appear to be approaching breaking point, by loosing the rope at one end, the entire mass will be liberated; after which, of course, the net can be replaced. These heavy masses of weeds going down in a body will only spoil one's chance for say a

quarter of an hour, while the continual drifting would effectually destroy the entire day's sport. At the end of the day's fishing the net can be removed, and hung up to dry, so as to be ready for use the next day.

CHAPTER V.

POACHERS.

Definition of term poachers as used here.

UNDER the comprehensive title of *poachers* there are included here all the Vertebrata that prey upon the fish. Perhaps, too, some few of the Invertebrata ought to have been treated under the same heading. One of them, the large water beetle (*Dytiscus marginalis*), certainly in the larval stage and possibly the mature beetle, preys upon the fry and yearlings. At the moment of writing I have the clearest evidence of this in the shape of a naturally bred yearling trout and a Dytiscus larva preserved in spirit. When taken the unfortunate yearling was dead, and the voracious larva was attached to the lower side of its abdomen, close behind the pectoral fins. In its death struggles the larva managed to disengage itself from the flesh of the trout, which was deeply scored by the formidable mandibles of the beetle. According

to the evidence of Mr. Armistead, in his admirable work on Fish Culture (to which the strangely misleading title of "An Angler's Paradise and How to Obtain It" has been given), the larger forms of caddis, or larvæ of the Trichoptera, attack the trout eggs and alevins. Possibly, too, other larvæ, such as those of the larger dragon flies, prey upon the eggs, and it would not be surprising to find that even shrimps and snails satisfy their appetites at times on trout ova.

The human poacher.

As man has been placed by modern scientists at the head of the sub-kingdom of Vertebrata, the same position must, I suppose, be accorded to him here among poachers. A certain school of sportsmen are in the habit of expressing sympathy with this class, saying that every true sportsman is at heart a bit of a poacher. Some go so far as to suggest that it is excusable for a poor man to poach an odd rabbit or hare, or an occasional brace of trout for his supper. This is not only nonsense, but worse still, as it is quoted by the rustics, until at last, even if they do not become poachers themselves, they will, by encouraging and shielding others, often prevent keepers from detecting them in the act.

In most villages there are a certain number of idle, loafing vagabonds, whose only visible

means of earning a living is by poaching. They are usually the most dissolute, the most intemperate, and altogether most repulsive looking set of scoundrels. Offer any one of them an honest day's work for a fair rate of wages and he will indignantly refuse it. Nay, more, offer him double the ordinary labourer's pay, and he will either find some excuse for declining it, or if he pretends to work will shirk and scamp to such an extent, that no one can employ him. Even if by chance he should work for a single week, it is safe to predict that he will be found at the village pothouse on Saturday night with some of his boon companions, more or less intoxicated. There he will remain, excepting during the hours when by law the pothouse must be closed, until every farthing of his wages has been squandered, and his credit, if he has any, exhausted. All this time his wife and children will be half starved, clothed in rags, living in squalid misery in a cottage from which the landlord is threatening to eject them for non-payment of a rent of two or three shillings a week.

Magistrates' sentences.

Magistrates, unless deterred by a wholesome dread of appearing in the week's "Legal Pillory" in *Truth,* will usually pass exemplary sentences on game poachers. It is, however, unfortunate that, when dealing with habitual

fish poachers, they will too often err on the side of leniency. It is well known that the game and other laws, for the preservation of fur, feather, and scale for sporting purposes, are distinctly unpopular with the lower classes. Although prompted by the desire to secure votes for political purposes, yet the policy of awarding comparatively slight punishment to those convicted of offences against these laws is not to be commended.

Receivers of poached fish.

No thinking man would in the present age advocate any course likely to lead to an increase in the numbers of the criminal classes by committing to jail in cases where a small fine would serve equally as a deterrent. It is, however, needful in such cases to bring forcibly home to the rustic mind that poaching, which is practically nothing but theft pure and simple, is to be as sternly put down by the administrators of the law as the picking of pockets. It would be well, too, if some effective legislation could be devised to bring under penalties those who purchase, whether for food or for purposes of trade, poached game or fish. The penalties, too, should be largely increased if the offence is intensified by the fact of such game or fish being out of season, and hence totally unfit for human food. The offence of the ignorant, half-starved villager who poaches is

no doubt a grave one, and if he prefers the lazy, loafing life of a poacher to the more laborious one of earning his bread by hard work, he should be punished with sufficient severity to stop him from further offending, and at the same time deter others.

The comparatively prosperous tradesman or publican, however, who knowingly buys from the poacher for the sake of the extra profit he can make, or of getting an article of food for his own consumption at a cheap figure, is to all intents and purposes committing the same offence as a receiver of stolen goods, and should be subject to the same penalties.

In dealing practically with the question, however, one must take things as they are, and be prepared to find that the sentence of a bench of county magistrates on the ordinary fish poacher will be a fine of 2*s.* 6*d.* or 5*s.* If it should happen that he is an old offender who has been before them on some twenty or thirty previous occasions, if the fish should have been taken out of season, and if the solicitor conducting the case could persuade the bench to listen and give some weight to this additional charge, they may possibly commit for a fortnight. On the other hand, if it is intended to try seriously to make a fishery, entailing heavy expenditure of both time and money, steps must be taken

to prevent the success of one's efforts being much delayed, if not altogether frustrated, by the action of poachers.

Keepers and poachers.

The most important factor in dealing with the poaching question is to have a good keeper or keepers. It is needless to say that a good keeper must be intelligent, honest, industrious, sober, capable, and, above all, take a strong interest in the ultimate success of the work. He must be endowed with strength, endurance, and pluck. He must be prepared to spend long hours of the night or early dawn alone or in the company of a well-trained dog, listening intently for any suspicious sound, and on the alert for any suspicious movement, ready at a moment to capture the poacher or to take full mental notes of the circumstances under which he may see the poaching carried on, for it may well happen that before the magistrates he may be subjected to severe and searching cross-examination by a sharp and not over-scrupulous attorney.

In connection with this point, too, the keeper's own character must be such as to stand the test. If in his past history there is anything which will tend to cast doubt on the reliability of his evidence, it will very likely come out, and the case will certainly be dismissed. Then, too, he should know something of the complicated

laws bearing on the subject—when and under what conditions he is legally entitled to seize nets or other illegal implements, or to search the offender; the conditions under which the poacher can be charged with illegally taking fish; when trespass only can be proved; and when he can legally be only warned off.

A first-rate keeper knows too that it is not good policy to keep on bringing charges before the magistrates, and he therefore often acts so as to prevent, instead of detecting, poaching. He sees men known to him as adepts in poaching making for a point in the river, and, taking a short cut across the meadows, he arrives before them and waits in ambush. If he desired to charge them he would, of course, keep out of sight until they had perpetrated the offence, but, as soon as their preparations are made, he suddenly appears on the scene and orders them off, calling them by name if possible. They are usually thus scared and beat a headlong retreat; and the continual recurrence of such action will soon convince them that it does not pay to poach on this keeper's beat. After all, the whole question is whether it pays, as there is no pretence at anything like sport in wiring, groping, or otherwise securing unseasonable trout, or in taking them out after the water is lowered to within a few inches of the bottom.

Keepers and men employed in water meadows.

The keeper should make himself acquainted with those whose avocations keep them near the water, and, without becoming their boon companion, gain their confidence so as to obtain any information they can give. From this information he must be able to sift what is authentic and likely to be of use after discarding what is unreliable, and worse than useless. As before remarked, he should keep on friendly terms with the floaters, drowners, or whatever the men regulating the hatches in the water meadows are called, so as to get due notice of prospective alteration of the water supply to the meadows, and be able to frustrate the efforts of the village poachers to levy toll on his trout in carriers which are dried up or very low. Unfortunately, some of these "floaters" are inveterate poachers and the most difficult to catch, since nothing short of the most direct evidence of their being seen in the very act of poaching would be sufficient to convict. Their daily and hourly duties would satisfactorily account for their presence in any part of a water meadow.

Otters.

Otters have, from time immemorial, been ranked very high among poachers, and credited with doing great harm to the trout. It is, however, stated on good authority that, so long as there are eels, pike, and frogs in the water,

these will be preferred as food by the otters to any *Salmonidæ*. Where there is any doubt on the point, as in this case, the safest plan is to take the benefit of it. Hence the advice to be given to the lessee of a fishery is to take every opportunity of shooting or trapping any that may be seen on the river or bye-streams. If there should be a pack of otterhounds in the neighbourhood, and the necessary permission can be obtained from the farmers, an intimation to the master of the hounds of the presence of otters, and an invitation to fix a day for hunting them on the stream, is an act of politeness which should be rendered to a brother sportsman.

Birds as poachers.

A large number of water birds must be classed among the creatures which prey upon the *Salmonidæ* at various stages. Gulls and other similar species of those bred in the sea are occasionally seen far inland, especially in abnormally cold or rough weather, and should be ruthlessly shot by the keeper. Herons are probably of all indigenous birds the most dangerous enemies of the adult trout, not only destroying what they require as food, but killing and leaving others even when too large for them to eat, seemingly from wanton cruelty. They should of course be kept down, but they are not easy to trap, and do not often venture within range of a man carrying a gun.

Kingfishers are the most deadly foes of the fry and smaller yearlings. Their appetite seems insatiable, and the precision with which they dart on and seize their prey is remarkable. No sportsman likes to take the life of so beautiful a bird as a kingfisher, although probably from the view of the lessee of a fishery engaged in stocking up a river, all and every means should be used to get rid of them. If there is a stew or other place in which store fish are kept for any time, nothing but a series of traps on posts and an occasional charge from the keeper's gun will serve to keep them down.

Swans and ducks.

Swans and ducks do incalculable injury to the eggs and alevins, if not to the fry. It may be said that they are vegetable feeders, but no one watching them busily at work on a shallow during the early spring can have much doubt that, whether they positively devour them or not, they certainly do much mischief by tearing up from the gravel, turning adrift, and destroying the ova or newly hatched fry still encumbered by the umbilical sac. Apart from their injury to the fish themselves, ducks are an unmitigated nuisance on any part of a river. They devour Mayfly, and sometimes the smaller *Ephemeridæ* as fast as they hatch out. They are always in the fisherman's way, and if driven away disturb all the water over which they pass.

In fact, after many years' experience, I can only offer one word of advice to any lessee of a fishery. If you have control of the water, do not, under any condition, or to oblige any neighbour, allow a single duck on any part of the fishery. If, after due warning to the owners, they trespass, shoot them, and leave their bodies to float down. In any case neither you yourself nor your keeper should touch them, otherwise you may be charged with theft. Moorhens and dabchicks are probably to be credited with the same propensities in the spawning shallows, and should be kept down as far as possible.

Fish as poachers.

Among fish, chub, perch, and eels are certainly destructive; and overgrown trout, especially old male fish, are dreadful sharks. Roach, dace, bullheads, sticklebacks, and even minnows, if too numerous, do harm by competing with the trout for the supply of food, and it is questionable whether they do not also at times feed on the ova, alevins, and young fry. Wherever and whenever, in plying nets or other means of catching fish, any of the above are secured, it is hardly necessary to say that they should not be returned to the water.

Pike.

The late Francis Francis, in his "Practical Management of Fisheries," commences Chapter IV.:

"And now as to the enemies of trout. These are *chiefly*

pike, birds, and poachers. I put pike first because one 4lb. pike will do more mischief in a season than all the poachers in the district."

For years, in the columns of the *Field*, he kept on urging in the most forcible terms the effects of neglecting to wage incessant war on them. On many rivers his words of warning were disregarded, and his predictions were only too soon verified. Sport got worse and worse as pike increased in numbers and size, until now many parts of these streams are of small value, and are occasionally let at a comparatively low rent to some stranger for a single season. He never takes the water a second season, and the local agent has to advertise again in the hope of catching another flat.

Voracity of pike.

It may possibly be imagined that the various estimates of a pike's capacity have been exaggerated, and I would therefore give the following examples of the undigested contents of pikes' stomachs as revealed by autopsy:—On the 18th April, 1893, wired a pike 9in. long; found tail of a partially digested trout quite 4in. long protruding from its jaws. On the 27th September, 1893, a pike 7½lb. was taken in the nets; the contents of its stomach were as follows: two small pike about 9in. long, nine lamperns, five bullheads, and a trout about 1½lb., with only head partially digested

and tail projecting from its mouth. March 26th, 1894, a pike 11in. long wired in a hatch hole, had three lamperns, two bullheads, and two yearling trout in its stomach. October 3rd, 1894, a pike 2½lb. taken in net, with tail of a trout quite ¾lb. in its mouth. This trout was scarcely dead when taken from the pike's jaws.

Take these four examples, multiply them by the thousands of pike in a neglected trout stream, consider the rapid rate at which they increase, and no further argument can be needed to demonstrate the paramount necessity of declaring war to the knife against *Esox lucius*.

CHAPTER VI.

NETTING.

HAVING shown the necessity of killing down the pike in every possible way, the best method of effecting their capture, viz., by netting, must now be considered. If pike are plentiful, it is desirable that the fishery should be thoroughly netted twice in the year; the first, or spring netting, before the commencement of the fishing season, when the growth of the weeds has scarcely commenced; the second, or autumn netting, after the close of the trout season, and when all the weeds in the river have been cut as closely as possible. Of these the netting in the spring cannot be as thorough as that of the autumn, as there will certainly be patches of weeds in places which will effectually shield pike, even if they do not make the nets roll and liberate some of the fish already entangled in their meshes. During the first two or three years' tenure of a fishing that

has been neglected, it is, however, most necessary, as a considerable number of pike are thus captured just before or during the spawning season; but when once their number has been reduced to a minimum the spring netting may be omitted, and only the autumn netting carried out. Whether for the spring or the autumn netting the same preliminaries are required, the same nets are used, and all the special methods and details are identical.

Preliminary work.

It is desirable that all arrangements should be carefully planned some time beforehand, and it is necessary that the riparian owners and tenants, whether farmers or millers, should be consulted before fixing the dates for commencing the netting. For the autumn netting the weeds must, of course, have been cut, not only in the main stream, but also in all bye-streams, tributaries, carriers, and ditches wide enough to hold pike. To net effectually, the entire control of hatches and sluices should be in the hands of the fishing keeper during the netting, as he must be empowered to draw the water down to the low level requisite, and, in some cases, keep it at this low level for some days, thus temporarily preventing the mills working. He must make himself fully acquainted with the state of the meadows adjoining the river, as otherwise the lessee of the fishery may

find himself confronted by a formidable claim for compensation for flooding low-lying ground, and perhaps destroying a crop of partially made hay, or damage to sheep or lambs. It is, however, found in practice that by giving long notice, seeing tenants themselves and not their servants, and generally treating them with courtesy and consideration, the inherent difficulties of the position are usually overcome.

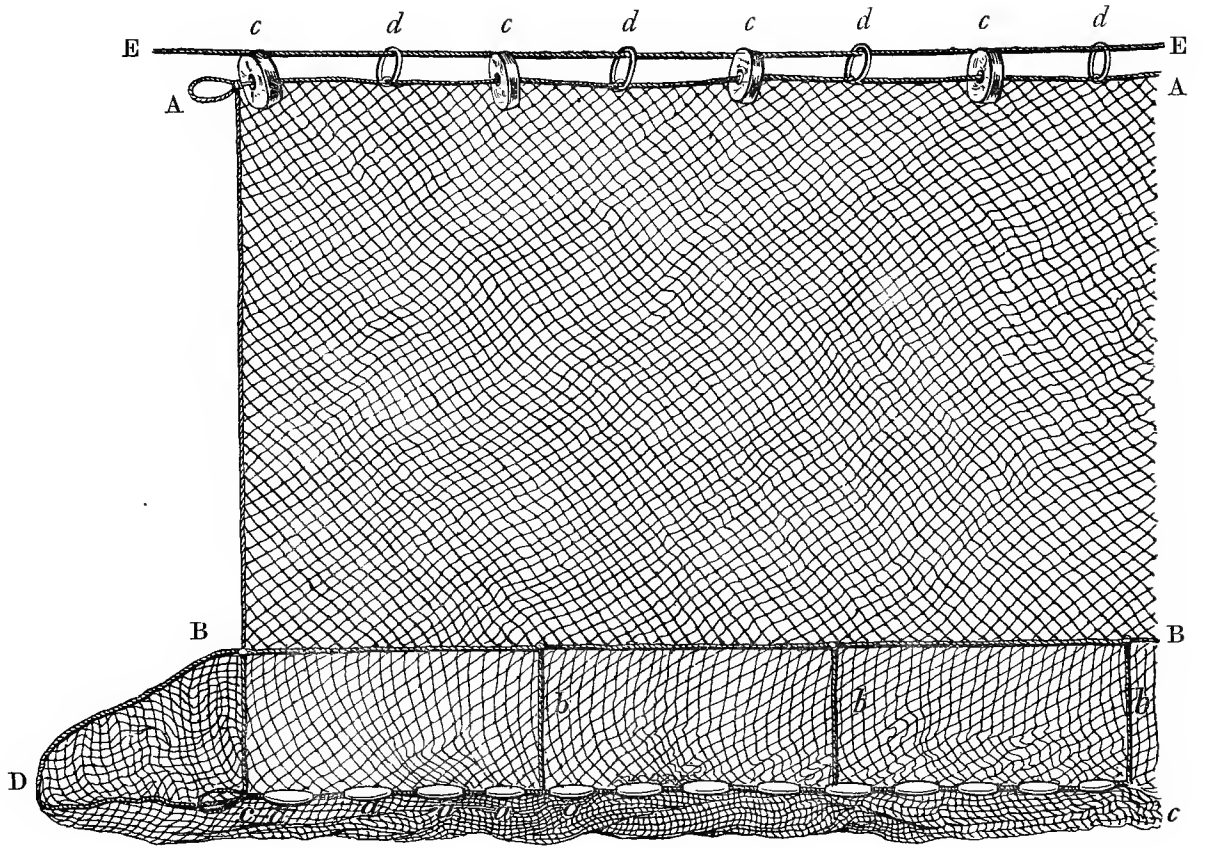
The dates should, if possible, be so fixed that the entire water from top to bottom should be netted in sections on consecutive days. On a strange length it is a good plan to drag a heavy chain down the stream a day or so before commencing the netting. In this way the presence of snags, stumps, old hurdles, or other obstructions is discovered, and their position determined, so that if they cannot be removed precautions can be taken to save the damage and delay caused by the nets fouling them. The use of the chain will also indicate the position of deep holes, and give some general idea of the contour of the bed of the river in the various reaches.

Nets required.

The method of netting laid down here cannot be carried out with less than three nets, and it is needless to say that they should be of the best quality. If they are not kept in a good state of repair, if the material of which they

are made is unreliable, or if there are holes or broken meshes in them, they are comparatively useless. They should be long enough to stretch across the widest part of the stream, and deep enough to reach to the bottom when the water has been drawn down to the low level required for carrying out the work. In theory, the smaller the mesh and the finer the twine of which they are made, the less chance there is for fish, large or small, to escape, and therefore the more effectually the work is done. On the other hand, the heavier the twine of which the nets are made the better they will wear, and the less liability will there be for them to get torn or broken by the weeds, confervoid, leaves, mud, sticks, stones, and other rubbish they collect when being dragged down.

It must also be remembered that the larger the mesh the less will nets become clogged up by the heterogeneous accumulations on the bed of the river. It is therefore recommended that they should be made of moderately stout twine and of a moderately large mesh, be heavily weighted so as to sink the lead line quickly, and provided with plenty of bungs to float the cork line. The much advertised machine-made nets are not recommended. The twine of which they are manufactured is far too thin for rough usage. They are generally insufficiently



DRAG NET.

weighted, and deficient in corks for floating. Then, too, they cannot be properly repaired by hand workers, and if sent to the manufacturers the charge is so high as to be almost prohibitive. The chief varieties of nets to be used for this work are the drag or flue net, the trammel, and the purse net.

Drag nets.

The flue or drag net, as shown on the accompanying plate, consists of two parts. Firstly, the perpendicular wall of net from A to B; and secondly, the bag from B to D and back to C, and extending the entire length of the net. The line A A, called the head or cork line, has fastened to it at intervals a series of corks, *c c c*, to float the net. Evenly spaced between these corks are also fastened to the line A A ordinary horn rings, *d d d*. The line E E is simply passed through the rings from end to end of the net, and is fastened to the central ring only.

Attached to the line B B, at intervals, there are short lengths of vertical line *b b b*, which are also attached to the foot or lead line C C, on which the pipe-shaped leads *a a a*, spaced four to five inches apart, are carried. By this arrangement when the net is dragged down, the leads keep the lower side of the bag on the ground, and the fish find their way into the bag by the ten inches of open space at its mouth from B to C. In some nets instead of pipe

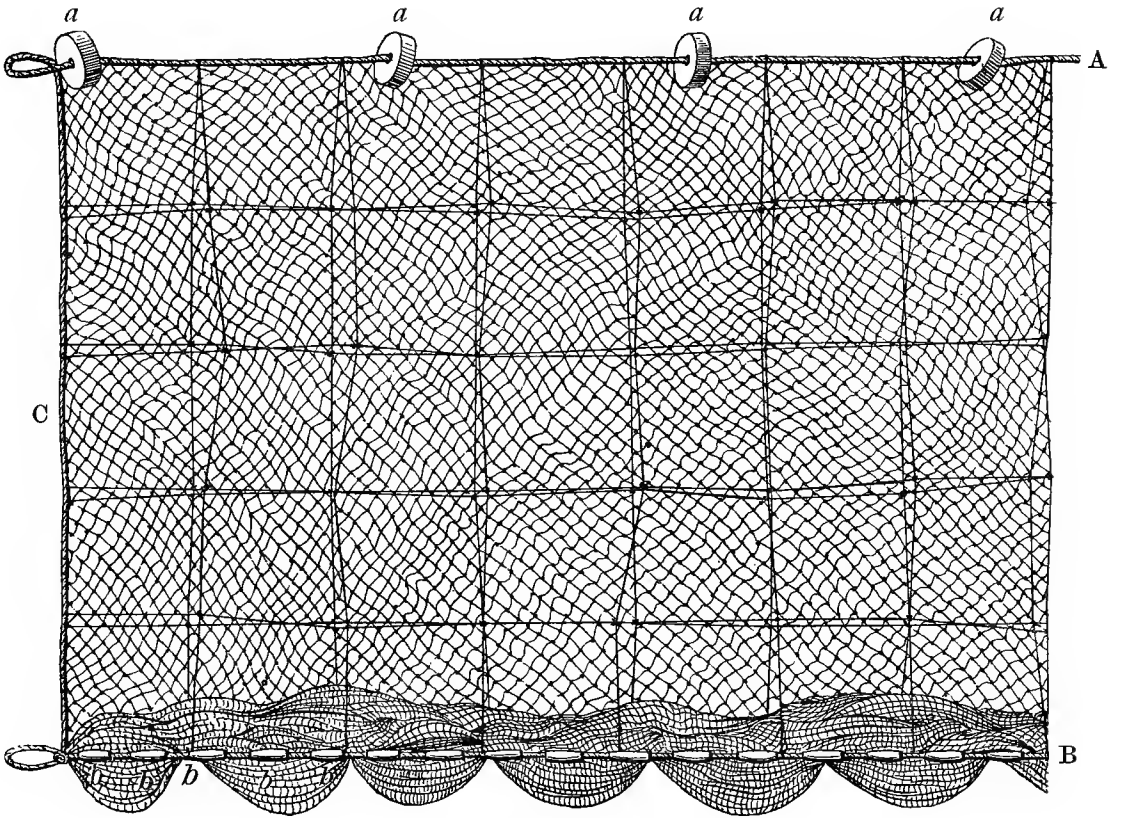
leads a galvanised chain is substituted, and it is said that the chain works better than the leads, especially over weeds, as it is less liable to roll or lift.

When hauling the drag net, both ends of the cork line A A are brought round to the landing bank, and the two ends of the line E E being pulled in, the net is gathered up from the centre until the corks are all close together, and the entire length of the net a bag containing the fish. To work satisfactorily, the line E E must be moderately fine. Its only use is to gather up the upper end of the net, and it should under no circumstances be used for lifting.

The suggested dimensions of a drag net for ordinary use are—length, eighteen yards; depth of the perpendicular portion A to B, four feet six inches; depth of the bag from B to D and back to C, four feet six inches; the corks four inches in diameter and twenty-two inches apart; the whole net of quite strong twine and a two and a half inch mesh throughout.

The trammel.

J. C. Wilcocks, in his "Sea Fisherman," under this heading, says: "The appellation of this net is doubtless of French origin, for '*trammel*' is evidently '*trois mailles*,' or three meshes, which exactly describes the net. It consists of a loose net of small meshes, or sheeting, between two tighter nets of larger



TRAMMEL.

meshes called the walling." In the accompanying plate the large square mesh of the walling is shown in strong lines, and the fine diagonal mesh of the sheeting is shown in comparatively faint lines. The sheeting must be much longer and much wider than the walling (some authorities say not less than twice the length and twice the depth), and hence the slack is shown lying on the ground in the plate.

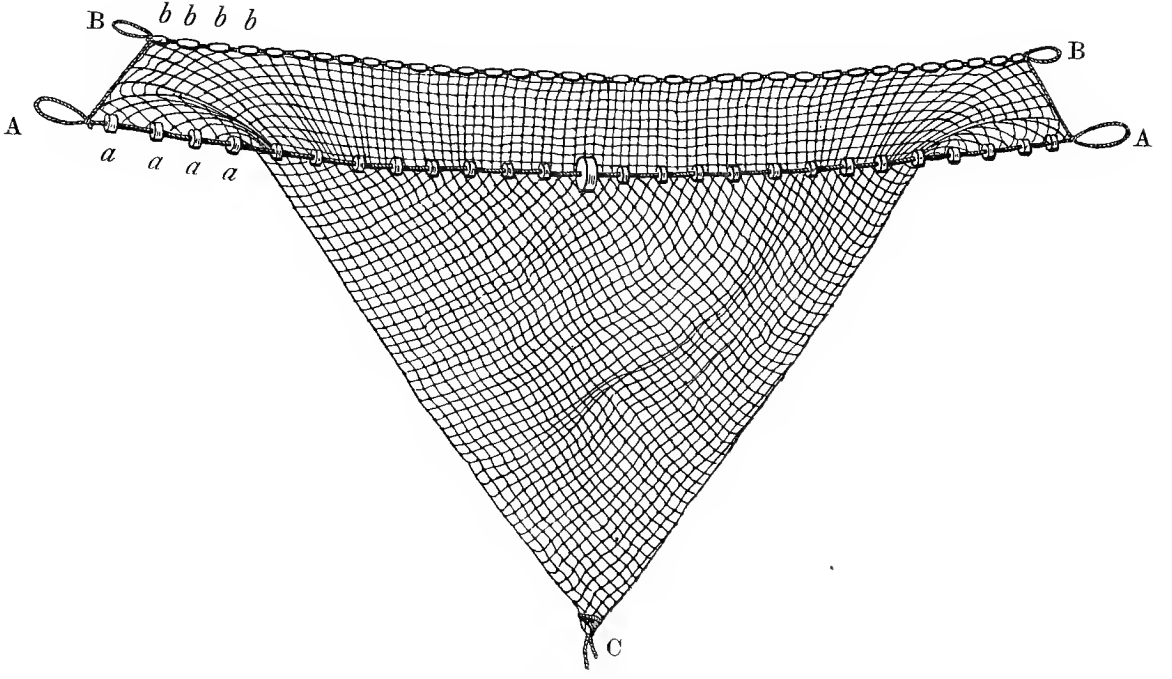
Referring to the plate, A is the head or cork line, and B the foot or lead line, *a a a* the corks on the cork line to float the upper side of the net, and *b b b* pipe-shaped leads strung on the lead line four inches apart to sink the lower side of the net. The ends of both lines A and B are worked into loops for the convenience of attaching ropes to them for hauling, &c. For lacing together two or more lengths of trammels in an extraordinarily wide part of the stream, a length of rope can be fastened to the loops on the lead lines, worked round the vertical ropes C at the end of each trammel, and fastened round the loops of the cork line. The walling, preferably square, should be of very strong twine, fifteen inches mesh, and the sheeting of fine twine, say two inches mesh. Altogether, compared with the drag net, the trammel is lighter in material and finer in the mesh of the sheeting, but of about the same dimensions.

Purse net.

The purse net, of which a plan is appended, consists of a head or cork line A A, with corks *a a a* fixed to it at intervals, and a foot or lead line B B, with pipe-leads *b b b* attached to it at intervals of four or five inches. It is usual to have the centre cork considerably larger than the others, to show the centre of the opening to the purse, which, when the net is in use, is of course under water. The net throughout is of a small mesh, about two inches, and from a short distance out from each end, a short distance above the lead line, and a short distance below the cork line, the netting is done so as to form a long funnel-shaped purse or bag, finishing in a point C at the centre of the net. It is a better plan to have the purse made so that instead of coming to a point at C, it should be a square, opening, say, eight inches in width, and a stout cord fastened a short distance above. By this means the fine end of the purse is closed by tying round with the cord when in use; and when the net is hauled, by simply untying the cord and opening the mouth, the fish can be taken out, or any accumulation of rubbish cleared from the net.

Labour for netting.

The nets being in order, and the dates for netting having been decided, the next step is to engage the labour required for the work. Men accustomed to work in the water are to be



PURSE NET.

preferred, and a sensible keeper will avoid any bearing a bad character or suspected of poaching. It is, of course, of advantage to employ the same men from year to year. It must be remembered, too, that being more or less wet through all day, they are entitled to wages on a proportionately liberal scale. The best plan is to fix a daily rate of wages, to include beer, as it is a great mistake to have anything to do with providing this liquid refreshment. Countrymen fall into the error of imagining that frequent draughts of malt liquor or spirit tend to raise temperature, and hence are apt to indulge somewhat freely on these occasions. Probably no amount of medical or other evidence would convince them of the well-known fact that, although for the moment alcohol or beer apparently raises the temperature, yet in the end it tends to lower it, and that therefore anything beyond a moderate allowance increases the discomfort of remaining in the water. The water level having been lowered as much as possible, and all nets and gear brought to the upper end of the reach to be netted on the particular day, all is ready to commence work.

Improved method of netting a reach.

Someone, the head keeper for choice, should be invested with full authority to direct everything, and it should be forcibly impressed on all

present, whether the men working the nets, the lessee himself, or any friends and spectators, that his orders must be scrupulously obeyed by all and every one. Having arrived at the head of the length of water to be netted, the keeper selects a convenient place at the lower end of the reach where it is moderately shallow, and where, if possible, there is a good sloping bank on which to land the nets. Here the purse net is set as a stop net. The cork line should be carried across, lifted well up, and the purse

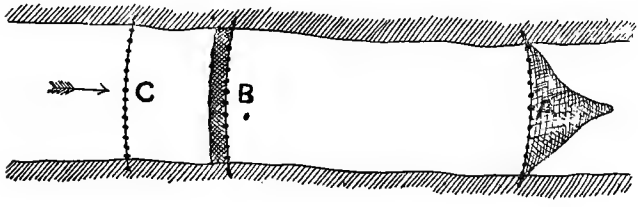


FIG. I.

cleared, so that it lies evenly down the centre of the stream. It must be secured to stakes, or held by men, one on each bank, so that the strain is not sufficient to raise the lead line from the bed of the river.

The trammel is set across the stream at the upper end of the reach, and the drag net some ten yards below it. Of course, care is taken that the lead lines of both are on the bed of the river, and the cork lines fully extended and none of the corks foul of one another, or entangled in

the cork line or meshes of the nets. The accompanying plan (Fig. I.) shows the positions of the nets, A being the purse net set as a stop net, B the drag net, and C the trammel.

The men dragging the nets, two to the drag net and two to the trammel, are then started walking quite slowly down in the water close to either bank, or, if the water is too deep, on the bank itself. The men must be drilled to keep in line and maintain the distance between the two

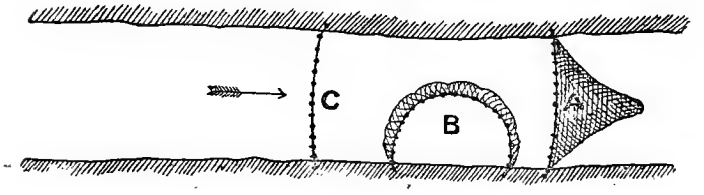


FIG. II.

nets, and when working round a curve the men on the inner or convex side must be taught to regulate their pace by that of their fellow labourers on the outer or concave side. A little instruction will show them that the man on the concave side has the longer distance to cover, and thus the man on the convex must slow down his pace, or, if necessary, even stand still.

When the heavy flue is within ten or twelve yards of the stop net, the dragging of both nets is discontinued, and the drag net itself is drawn

round to the landing bank. The accompanying plan (Fig. II.) shows the position of the nets, A being the stop net, B the drag net, and C the trammel. Keeping the lead line well down, and working slowly, the cork line is drawn from either end so as to run through the rings, and close the opening of the bag of the net. It is then hauled out on to the bank, and all fish, whether pike, dace, trout, or grayling, taken from it. The net is then carried back

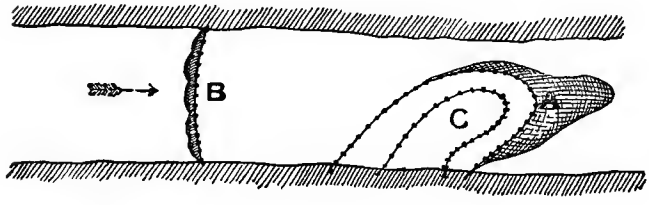


Fig. III.

upon the meadow, run out, well shaken, and cleared of all sticks, weeds, and mud; it is then set across the stream ten yards above the trammel.

The trammel is next dragged down to the position occupied by the heavy flue before being hauled, and simultaneously it and the stop net are drawn round to the landing bank, the stop net outside and encircling the trammel. The accompanying plan (Fig. III.) shows the position of the nets at this moment, A being the

stop net, B the drag net or heavy flue, and C the trammel. Working slowly, and keeping the lead lines well down, and especially close to the bank, taking care that the stop net should not overlap or foul the trammel at this stage, first the trammel is hauled and then the stop net; fish are taken out, and both nets cleared of rubbish. The stop net is then set at the lower extremity of the next length to be netted, the trammel is set across the stream ten yards above the heavy flue, and the operation of dragging repeated *da capo*.

Advantages of improved method of netting.

The foregoing method is to be adopted when netting the reaches of a stream, and special attention is directed to one matter of detail connected with it. Formerly, when netting a length of water with two drag nets and a stop net, the custom was to haul the first, then the second, with the stop net encircling it; clean all nets, and start again. It was found, however, that when all three nets were on the bank, a shoal of dace, or an occasional pike, would dash up stream to the length which had been already netted. So long as the water was clear and shallow this could be seen, and the length netted a second time. In deep water, however, or water rendered thick and discoloured by the tramping of the men with the nets, the extent of the mischief could only be conjectured; and

hence the adoption of the improved plan of setting the heavy flue temporarily as a stop net, to prevent fish from escaping by swimming up stream. At times and in places variations have to be improvised to meet the exigencies of particular cases: thus, for example, if there should be an island in the middle of the stream, the stop net should be placed below the island, and the water at each side either netted down separately, which would require two extra nets, or, as an exceptional case, the water could be dragged by one net only on each side, the two nets coming into position and working one behind the other in the main stream below the island.

Use of the third net.

All ditches and carriers leading into the stream should be well beaten down with poles, or trodden down by the men just before the nets have reached the point of their juncture with the river, so as to scare all the fish out of them. A few short trammels are useful in such cases to set across the mouths of such ditches as stop nets, or the men treading them down can remain in the water, splashing, and preventing the pike from retreating into the carriers until the nets have been dragged past them. Stamping on the banks close to the edge may drive out pike that have taken refuge in rat holes or cavities in the sides.

The advantages derived from dragging two nets in place of one, especially if the upper one is a trammel, cannot be too strongly insisted upon. In working upon this improved method, the number of pike that strike the heavy drag net and escape, either by finding a way over the top line, between the corks, or by forcing a way through the meshes, is quite surprising. Under the old method every one of these got clean away. Now, however, the jaunty air with which they gaily swim up stream, no doubt congratulating themselves on their escape, to find themselves helplessly entangled in the meshes of the sheeting of the trammel, which their own rush up stream, combined with the downward movement of the net, has driven through the walling, makes the situation almost comical. The only disadvantage of the trammel is that a number of trout and grayling, especially small ones, which have eluded the heavy drag net, are bagged, and, unless great care is taken in freeing them from the fine meshes there is likely to be serious mortality among store fish.

Number of hands required.

To carry out netting on these lines it is desirable to have not less than six strong, willing men—one to each end of each net. It may appear to a casual reader that four would be sufficient, as after setting the stop net the two men in charge have apparently nothing to

do until the two nets have been drawn down within a short distance of it. If economy is the desideratum, these men could in the meantime be employed in pulling one of the nets; but if efficiency is considered all important, the necessity of having plenty of hands cannot be too forcibly urged. In many of the deeper parts of most chalk streams there are places where the men pulling the nets sink into the mud up to their knees, or even deeper, and under such conditions the greatly increased exertion is apt to make them shirk the deep mud, and allow coarse fish to escape. When a man, walking on the bank, keeps the rope at each end of the net taut, the labour of making way through the mud is much decreased. If by any chance a man gets stuck in the mud, it is well to impress on those trying from the bank to help him out, that they should only keep the rope tight. With this assistance he can almost invariably struggle out, and the danger of serious injury by wrenching or dislocation is only increased by pulling violently at the rope.

The two men who are free after setting the stop net are available for this purpose; also for such duty as treading out pike from places under overhanging bushes and other positions where the nets cannot be dragged. Then, too, they can be utilised for driving pike out of

ditches and carriers by splashing and walking them down before the nets reach their junction with the main river, and when arrived at the mouth of the ditch they can remain there, tramping and splashing to prevent the fish from getting back into the ditch. They can also at times relieve the men dragging the nets.

All coarse fish taken, as well as any ill-conditioned or old trout that have to be knocked on the head, should be given away in the adjacent villages, and this might have the effect of removing from the rustic mind any lurking suspicion of the netting being undertaken for the purpose of deriving pecuniary advantage from the sale of the proceeds. Two sharp active boys, in addition to the men, can be profitably employed in carrying down the various implements required, and, where practicable, a wheelbarrow is a convenient form of conveyance. Plenty of spare ropes should be carried, as also strong twine for the temporary repair of broken meshes in the nets, a sack for the coarse fish, a couple of large bait cans or a carrier of the milk churn form in which to keep trout or grayling alive until they can be returned to the stream, a good strong galvanised pail for fetching and carrying fresh water to the bait cans, stakes for fixing the stop net, poles or

bamboos for beating out places or for clearing any net which should get foul in deep water.

Head keeper's duties when netting.

Even in the presence of the lessee or proprietor of the water, the head keeper should be in command, and direct every detail. He should not attempt to do much himself, but having seen that the stop net is securely fixed at the point selected by him, should follow the two nets as they are dragged down on the bank, and in case of any hitch his assistance should always be available to clear a net. He should continually remind them that for effectual netting there must be no hurrying, but that while it is essential to keep the nets moving, they can scarcely move too slowly. The drawing round of the nets must not be hurried, and the lead line must be kept well down.

When a net is once on the bank all trout and grayling should be promptly taken out; old or ill-conditioned specimens should be knocked on the head, and the remainder deposited in the bait cans or carriers, which should be filled with water before the net is hauled. The pail should also be kept full, and fresh water poured from it into the cans as often as possible if they are in any way crowded, or if the fish show signs of exhaustion. It is of advantage, too, to pour the water from a height into the cans, for the sake of more thorough and rapid aeration.

Keeping records of netting.

The ideal keeper should always be at the point of danger; he should seldom, if ever, raise his voice, and yet he must insist on implicit and immediate obedience from everybody concerned. The lessee of the fishing, if present, should not interfere with the keeper, or do anything likely to undermine his authority. He can, however, do good service by taking off the keeper's shoulders the most necessary and important work of keeping accurate records of the fish taken at each haul. He can, if he likes, also undertake the duty of looking after the trout and grayling in the cans, and see to their being properly supplied with fresh water until the nets have progressed far enough to enable him to return them to the river. When doing this he should be careful not to throw in the fish with violence, or so that they should fall flat on the water, as the concussion may stun, or even kill them. He should make it a rule to wait until all the fish returned to the river have moved away from the side; otherwise the first loafer coming along is only too likely to pick them up and knock them on the head.

It is well to map out the successive days' netting so that each evening's work should, if possible, terminate at a hatch. As a considerable number of both coarse fish and

Salmonidæ are often driven down by the lowering of the water and the dragging of the nets, a plan recently adopted with advantage has been to net the hatch hole at the end of the day's work, and return the trout or grayling to the river above. The next morning's work should commence with another netting of the hatch hole, and, according to the views of the lessee, the trout and grayling should either be turned back above, or into the hatch hole itself.

Netting a hatch hole.

When netting a hatch hole, the hatches should be closed, to lower the water as much as possible. If the shallow bar below the hatch hole is almost dry a stop net is unnecessary, but if there are four or five inches of water on it the stop net should be set as usual. One of the other nets, either the drag net or the trammel only, will be required to clear the hole. After splashing or poking any fish out from under the apron the net should be dropped in close to it and steadily drawn round to the stop net; hauled, emptied, and cleaned. This should be repeated as often as any pike are secured; or, if it is desirable to move trout out of it, as long as there are trout in the net.

Statistics.

The following table is an accurate record of the results of careful netting of a length of trout water for the years 1893 and 1894. For

convenience of reference it is divided into six sections, numbered consecutively, from the upper end of the water to the lower.

Section I. is about two miles in length, and is practically free from pike, as the four netted out of it during the two years referred to were all taken within a hundred yards of the lower end of it. Section II., in which are included a considerable number of tributaries and carriers, measures about two and a half miles, and the remaining Sections, Nos. III., IV., V., VI., are approximately one mile each.

	Sect. I.	Sect. II.	Sect. III.	Sect. IV.	Sect. V.	Sect. VI.	Total
1893.							
Spring netting	not netted	32	51	140	25	47	295
First autumn netting	3	47	269	310	78	42	749
Second „ „	not netted	37	85	150	100	31	403
Total for 1893...	3	116	405	600	203	120	1447
1894.							
Spring netting	not netted	27	26	72	63	45	233
First autumn netting	1	23	62	175	112	48	421
Second „ „	not netted	5	10	17	30	not netted	62
Total for 1894...	1	55	98	264	205	93	716

These figures are given in detail to show that with the most careful work a certain number of pike manage to elude the nets. It also shows

that persistent netting will, in time, thin their ranks. Too much stress cannot be laid upon matters of detail connected with this branch of the work. No enemy is so deadly throughout the year, so generally present in chalk streams, and so insatiable in appetite, as the pike; and no method of killing down is so efficacious as the net. As, in spite of all care, a certain proportion manage to escape, it is to be feared that the most persevering work will not succeed in extirpating the enemy from the streams in which he has once become established. A knowledge of the means by which they do escape may, however, be of use, as well as interest, to lessees and proprietors of trout streams.

The weak points of netting.

Many of the coarse fish will always be small enough to get through the meshes of the nets, and although at the first glance it would appear that the mesh might be almost indefinitely reduced, yet in practice this is only possible to a limited extent. In every stream there are more or less of natural obstructions, such as mud, weeds, stumps, roots, stones, &c., and wherever a river flows through villages or towns it is, unfortunately, the daily custom of the inhabitants to throw into it much of their broken glass and crockery, their empty tins, and worn-out kettles and pans. The smaller the mesh

the more of these miscellaneous articles are gathered as the net is dragged down, and the more often it is necessary to haul ashore and clear it; the sooner also it is torn and destroyed, and of course a hole or tear in a net is fatal to success.

Wherever the mud on the bed of the stream is a few inches deep, it is only necessary for a fish to bury itself in it, or to take up its position behind a stump or large stone, to be in comparative security; it will only be inconvenienced to the extent of feeling the lead line scrape over its back. However closely the weeds may be cut, there are sure to be small patches left here and there, and it is surprising how small a clump will raise the leads sufficiently to let them pass over any fish which has taken shelter under them.

Wherever there is an extra deep hole there is a chance of escape for fish under the net if the leads are not heavy enough to sink the corks, and over the net if they are. Every bough, root, or stump, projecting into the water, as well as every part where the outline of the bank is irregular, or much riddled by rat-holes, is a hiding-place for the crafty ones among the pike. In many places the mud silts up close to the banks, owing to the force of the current being greater in the central portion of the river. The

natural tendency of the men dragging the nets under these circumstances is to take a pace outwards from the bank on to the harder ground, and thus save themselves the labour and inconvenience of having to toil along, step after step, up to their knees in the mud. As soon as they do this pike after pike will take the opportunity of escaping by swimming up in the space between the men and the bank, and if the water is, as usually happens, discoloured by the tramping about, their escape is unnoticed, even by those directing the operations.

The use of two nets, dragged one behind the other down towards the third or stop-net, and the adoption of the improved method of working, described in a previous paragraph of this chapter, certainly tend to remove one source of danger in this respect. Where this improvement is adopted one net is always above the water to be netted, and the fish never have the chance of dashing upstream, and, for the time, getting away altogether.

Netting to be done slowly.

The most vital point, and one requiring increasing attention, is to check the tendency which invariably exists on the part of the men to hurry the nets. It appears as if their one aim was to get over the ground as rapidly as possible, and one would imagine that their notion of the proceedings was that the greater

the distance dragged in a day the more satisfactory would be the result. Some of the old school of keepers employed on large estates, whose experience has been gained in breeding pheasants and trapping vermin, and who are therefore confident that they know all about a fishing keeper's duties, are the worst offenders in this matter. They have been taught that the less the labour bill for netting the more they should be commended, but are quite oblivious of the fact that the netting of a river is undertaken and the expense incurred for the purpose of effectually killing down coarse fish.

Whenever the pace at which a net is travelling is much faster than the current, the lead line is sure to lift from the ground and the cork line to dip below the surface, leaving two means of escape, one above and one below the net. When a net is being hauled ashore, undue haste will infallibly raise the leads and liberate some proportion of the fish enfolded or meshed. Hence it cannot be too steadily and strongly impressed on the head keeper in charge of the work that the Italian maxim, "*Chi va piano va sano*," applies, and he should ever convey to his men the caution not to hurry while dragging the nets, and to keep the lead line well down and close to the bank when hauling them.

Netting by lessor not satisfactory.

On some waters the lessor undertakes the payment and consequently the direction of the keepers, and the tenant is usually told that the length he rents has been thoroughly netted on certain days during his absence. Sometimes it is delicately suggested that he should give a gratuity to the keeper to be distributed among the men working the nets, and sometimes even he is coolly asked to pay for the extra labour. If he is liberal and moderately easy going, he frequently accedes to this request under the pleasing delusion that the work has been well and effectually done. If he had only been present he would have seen how a single net had been raced down stream as fast as the men could travel and, without any stop net being fixed, periodically hauled out. If he had the opportunity of contrasting this with real good work carried out with two nets dragged down slowly to a stop net, he might have some idea of the miserable sham for which he had been induced to pay.

A curious illustration of this occurred to me some short time since. A local under-keeper, out of situation, called on me to get appointed to a vacant post on a water I was superintending. He told me that he had been *fisherman*, as he called it, for some years on an adjoining property, that he was a native of the place, and

knew every inch of the stream we rented. By way of impressing on me a due sense of his knowledge, he volunteered the information that he could do the netting much more effectually and at a much smaller cost than the present head keeper. He said that a stop net was quite unnecessary, as every pike rushed up-stream when the net was dragged down. He added that the trammel dragged down behind the flue was absolutely useless. He seemed somewhat staggered when shown from my rough memorandum book that nearly fifty per cent. of the pike netted were taken by the stop net and trammel. However, he added in a triumphant tone, "They certainly rob you in taking so many days over the work," and suggested that he could net the entire water, ditches, carriers, tributaries, and main stream easily in two days.

Measured accurately on the large-scale Ordinance map, the total length of all the streams to be netted amounted to over eight and a half miles, so that he fancied he could net over four miles per day. As a matter of fact it takes nine or ten full days to net this stretch of water properly and effectually. It is, perhaps, needless to add, that this sapient rustic did not secure the vacant post.

Netting trout.

Trout are even better at eluding the nets than pike, and when you are told that a water

has been thoroughly dragged it is good policy to discover what number of trout have been taken. As a rule, however, it will be found that no accurate record has been kept, but that the number taken has been approximately estimated. It is safe to infer that this estimate is greatly in excess of the actual number; so much so, that no adequate idea can be arrived at by the deduction of any percentage. It may be safely asserted that, provided the work is properly done with three nets as described herein, a small proportion will have been captured. It is also safe to infer that the proportion of trout escaping the nets will have been larger than that of the pike.

Netting dace.

Of all fish that are usually present in any number in the ordinary run of chalk streams, dace are the most difficult to catch. When the three nets are comparatively close together, and a shoal of large dace can be seen between the lower drag net and the stop net, it looks like a certainty, and yet when hauled the result will often be only two or three fish. How they get away is sometimes a mystery, although of course the small ones can pass through any but the very finest mesh. They keep together in a shoal, swimming backwards and forwards in the ever-decreasing area between the nets. Presently one finds a hole in the net, or a space

between it and the bank, or a place midway between two corks where the cork line is slightly submerged, or a place where the net is raised by a stone, and the entire shoal one after another will dash through the same weak point. Perhaps the best time to secure them is in the spring, when they are congregating on the shallows preparatory to spawning, or engaged in the work of reproduction. Even then, however, it is doubtful work, although perseverance will in time produce an appreciable diminution of their numbers.

CHAPTER VII.

WIRING.

Difficult places to net.

AS shown in the last chapter, although netting is the most efficacious method of destroying pike wholesale, yet a certain proportion of these pests do manage to elude the nets. There are also places where netting is almost, if not quite, impossible; places where the growth of weeds is too dense, or the stream too rapid or too deep for the nets. Then, too, the reaches flowing past gardens of cottages or small houses, where from time immemorial the river bed has been used as the receptacle for every worn-out or broken article of hardware, crockery, or glass, until it has become a perfect *chevaux de frise*, over which a net dragged for a few yards would be quickly destroyed.

Then, again, in the hatch holes, which generally harbour some of the largest pike, there are sometimes stakes studded with tenter

hooks or other obstructions, which would tear the nets to pieces, and the depth is occasionally too great to be successfully manipulated by nets designed for use in the shallower part of the stream. Besides, at all times of the year the pike in greater or lesser numbers are to be found in carriers, ditches, and even the narrow irrigation ruts cut across the water meadows, many of which, being only a few feet wide, cannot be dragged by the wide nets used for the main stream. If, however, it is intended to do the work thoroughly, nowhere and under no conditions must efforts be slackened, nor should a single day's relaxation be permitted from the continual warfare to be waged on the pike.

Use of spinning bait and spear.

A few pike can be captured by spinning over likely places with natural or artificial baits, and the only objection to this method is that an occasional trout will take the minnow and dace, and get so badly hooked that its life has to be sacrificed. On some days, too, when they are basking in the sun, a few can be shot, but if they are more than two or three inches below the surface, it is scarcely worth while wasting a cartridge on them, as the water deflects the shot, and breaks the force to so great an extent as to render them comparatively safe. Spearing is advised by some authorities, and the spear should be a heavy, three-pronged one, as

shown on sketch (Fig. IV.) It should be screwed on to a strong ash handle, or, better still, on the point of an old, stiff, three-jointed jack rod.

Extermination of pike impossible.

According to the experience, however, of the best keepers, a combination of nets, trimmers, and wires, each persistently used in the place and under the conditions best suited to it, will be found the most efficacious means of keeping down these pests. The details of the netting were fully explained in the last chapter, and in this it is intended to give the necessary

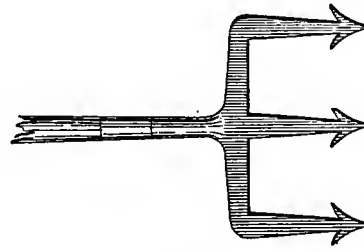


FIG. IV.

instructions for the use of the trimmer and wire. No means, however, yet devised will absolutely eradicate pike from a river, so that in a properly managed trout stream the keepers must never cease from their efforts to catch and destroy every one they see by any means in their power. Even if it were possible to kill down all one's pike, it must be remembered that every one of us is certain to suffer from the neglect of

our neighbours to do the same on adjoining waters.

In hatch holes or in deep eddying corners of the main river there are generally large pike. They often escape the nets and are frequently too artful to fall victims to the angler with rod, line, and spinning bait. For their capture

Use of trimmer.

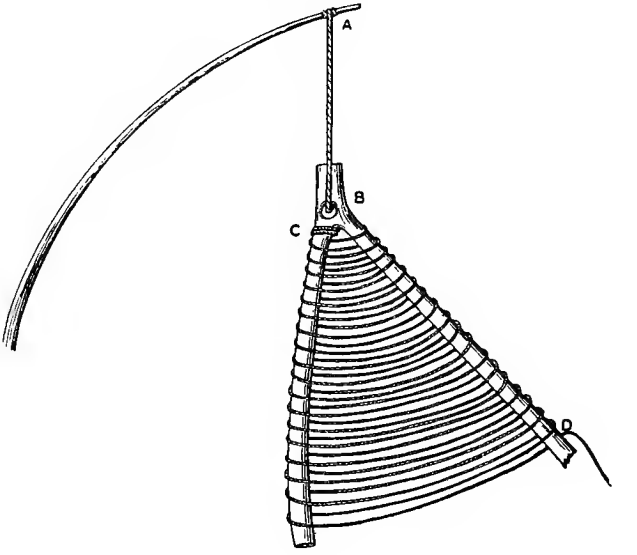


FIG. V.

nothing is so effective as a trimmer. The best form of trimmer is illustrated on the accompanying plate (Fig. V.), and it is made as follows: A supple stick, eight or ten feet long, and the thickness of a little finger at the small end, is driven firmly into the ground, so as to project

over the hatch hole or eddy. The runner, made of a forked stick with arms six or seven inches in length, is attached to the end A of the long stick by a short length of strong water cord passed through a hole (B) bored in the base of the runner. The line, which should be of stout water cord, is fastened to the runner at C, and is wound in and out of the arms of the runner, and the end of the slack fixed in a slit (D) made at the extremity of one of the arms for that purpose. About ten or twelve yards of line are sufficient, and three or four yards of loose line are left hanging below the slit. A moderate-sized double hook on gimp is fastened to the line, a lively dace or other bait threaded to the hook by a baiting needle passed diagonally upwards under the skin, from a point near one of the ventral fins, coming out on the back at a point on a line with the pectoral fins. The bait is thrown in and left to swim about in the water without lead or other incumbrance. Sooner or later the bait may be taken, and the pull will release the line from the slit, allowing it to unwind from the arms of the runner. The pike will gorge the bait, effectually hooking itself, and as it plunges the suppleness of the stick will play it until it is exhausted.

The bait should be fair-sized, say a dace of four or five ounces; if very small ones are

used they are often taken by trout, which are generally so much injured by the coarse hook as to succumb. For a large pike there is no better trimmer bait than one of his smaller brethren. Grayling do not make good baits, but possibly a lively trout of about ½lb. would prove very attractive to a large pike. Frogs are fairly good baits, but the objection to these is that trout often take them, especially if they are small. A dead bait is sometimes successful, but it should only be used when live ones are not procurable.

When once a large pike has been seen in a deep hole, it is only a question of time to secure it, although occasionally many baits are killed or torn from the trimmer before the pike is hooked. If, after persevering for some days, a fish known to be in a particular place does not take the bait set in the manner before described, it is well to try if the following alteration of the depth at which the bait works will attract it: Fasten a stone or bullet, a couple of ounces in weight, to the line, leaving two or three feet between it and the bait. Lower the lead or stone gently into the hole. This keeps the line down while the bait swims about above it quite freely near the bottom of the water, instead of working near the surface, as it does when adopting the method previously described.

The wire.

There is this objection to the use of nets, deadly as they are,—they cannot be used at a minute's notice or in every place where a pike is seen. There is, however, an instrument which in the hands of an expert is almost as deadly as a net, and is always at hand—this is the wire. To make it, take a length of brass wire, either single or of two or three strands twisted together, according to the size of the pike to be wired. At one end of it, marked A on the accompanying plate (Fig. VI.), twist a small

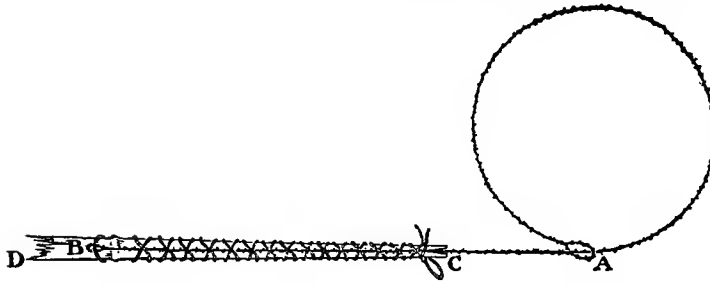


Fig. VI.

open loop or eye and pass the wire through this eye so as to form a running noose. At the other end of the wire (B) make another eye, and through it pass a piece of stout twine. C D is the stick to which the wire is fastened by a few turns of the twine, as shown on the plate. At the end (C) of the stick a deep notch, or split is made, and the wire is pressed into this notch to steady it. The wire, when fixed, should

be in effect a prolongation of the fine end of the stick, and the noose should be of larger or smaller diameter, according to the size of the pike, and should run freely. A stick for the purpose can often be cut from the nearest hedge, and as every keeper carries a few wires in his pocket, he can always, at an emergency, rig up the gear in this way. A bamboo cane of 16ft. to 20ft. in length is far more handy, and can be recommended for permanent use. It tapers naturally, balances to the hand, costs the merest trifle, and with ordinary care will last for years.

Use of the wire.

The keeper, with the fine end of the bamboo in his hand and the heavy end trailing on the ground behind him, should go out preferably on calm, sunny days in the morning, and, walking gently up the stream or carrier, keep a sharp look-out for any pike lying basking in the sun. As soon as he catches sight of one, having adjusted the size of the noose and seen that it runs freely, he should approach the water with slow and wary footsteps, taking care that his shadow does not fall on the water, noting exactly where the pike lies and in which direction its head is pointing. Placing himself in position, if possible at right angles to his quarry, and, keeping his eyes fixed on the pike, he should, with his hand quite low down, quietly

extend the stick and lower the noose slowly into the water a short distance above the pike's nose. If the pike moves he must cautiously withdraw the wire and commence again. When the fish remains quite still he should gradually work the wire noose over the pike's head. It is well to note that, as a rule, the tendency is to locate the pike higher up in the water and nearer to the operator than it really is, and hence the advice to keep the wire as near the bed of the river as possible. As soon as the noose is fairly round the middle of the pike's body, *i.e.*, in front of the dorsal fin, the keeper, standing with his body bending well forwards and his arm fully extended towards the water, should sharply, but without jerk, draw the handle of the stick back with a swing. The noose running up will then grip the pike, whose weight will keep the wire taut, and he should sling it underhanded on to the bank at his side. A single tap, just where the skull and spinal cord join, with a short stick kept for the purpose, should prevent further depredations as far as the particular pike is concerned.

Up to the moment of actual wiring, it is of importance that every movement should be slow and deliberate. The operator should never take his eyes off a pike when he has once caught sight of it. The rustic theory

that the pike is so deeply engaged in watching the man's eye that it does not notice the wire in front of its nose is ingenious; also another theory, that there is some snake-like fascination in the man's eyes that keeps the fish spell-bound. The obvious advantage of keeping one's attention fixed on the fish is that, should it not lie to the wire, but dart off, the movement can be followed, and, as soon as the pike has settled, a fresh attempt may be made. Occasionally this may happen five or six times, and the last effort be crowned with success.

Best time for use of wire.

On some days fish after fish will lie still and fall a victim, and on other days, notwithstanding every care, the pike seem imbued with a preternatural sense of danger, so that it appears impossible to get the wire near them. As a rule, hot, calm days are favourable, and windy, cloudy, or cold ones unfavourable, for the work. It is also worthy of notice that, in the forenoon, pike generally lie far better to the wire than later in the day. When once it is obvious that the day is unfavourable, it is better to postpone the work to a later opportunity; to go on is only to make the pike more and more shy and unapproachable. Often, if a fish darts away from the wire and goes to weed, the application of the butt end of the bamboo will drive it out, and sometimes, after being driven out several

times, the pike will be apparently cowed and lie motionless until the fatal noose is over it.

Advantage of wiring pike before spawning.

In the early spring, when most of the pike are up the ditches and carriers preparatory to spawning, a zealous keeper will be out day after day, and the number of pike he can wire is surprising. When a pair of fish are together in a ditch, it is most frequently the case that, of the two, the larger is the female and the smaller the male. The advice has been given to wire the male and leave the female for a day or two, as, generally, another male fish will arrive to assist her in the work of reproduction. In theory, this sounds feasible; but in practice, the danger of being too late with the female, and allowing her to deposit her ova, is ever present, and hence, perhaps, the safest maxim is "Carpe diem," and wire both male and female when you have the chance.

It is a good plan to have a few spare bamboos and wires about a fishery, kept in places where the poachers cannot get at them. If, too, one can once persuade one's friends to try wiring on an occasional off day, when the fish are not rising, it is wonderful how soon they take to it, and get quite keen about it. I have known cases where one's guests will prefer pike wiring to trout fishing, especially in the bright, hot days, when the trout are unapproachable,

and the pike seem as silly as possible. The number of pike to be taken by the wire is limited only by the stock in the river and the perseverance of the keeper. I know of one keeper who, in the latter half of February and March, 1893, wired 240 pike, and in the same water wired 366 more between the spring and autumn netting. A good many of these were from five to eight inches in length, and would have escaped through the meshes of the net to prey upon the fry for another year, had not the wire (a single one) cut their career short. These were chiefly taken in the meadow hatches, after the water had been diverted. Such places should therefore be carefully looked over on the first and earliest opportunity.

Persistent work with nets, trimmer, and wire, of course, in time thin down the ranks of the pike, but perhaps their effect is even more noticeable in the direction of the decrease of average size. Thus, in a piece of water where careful records were kept, in 1893, out of a total of 2087 there were taken forty-three pike of 2½lb. or over, while in the same water in 1894 only nine out of 836 weighed as much as 2½lb.

CHAPTER VIII.

STOCKING.

Insufficiency of natural stock.

THERE are possibly a few owners of water who still cling to the exploded theory that the natural reproduction alone in a river much fished is sufficient to keep up the stock. In other words, they believe that the number of naturally-bred trout which in each season reach maturity will suffice to make up the deficiency caused by the raid of the poachers, whether human, furred, feathered, or scaled, as well as the number killed by the more legitimate methods of the sportsman. Probably no amount of argument, no careful statistics of figures, no examples of the great benefit accruing to various fisheries from systematic stocking, would make any impression upon them. Yet there are undoubtedly among those holding this theory a certain number of proprietors of water who have no desire to sacrifice the fishing in order to save

expense—sportsmen who do not let the water nor attempt to derive any pecuniary advantage from it, but keep it purely and only for their friends and their own sport. I have heard, on good authority, of one sportsman of this class who actually introduced pike into his water!

There is, however, among the opponents of stocking a class for whom the true sportsman can have no sympathy—proprietors of trout water, who either let the entire fishing by the season or take in a number of rods to whom it is altogether a matter of profit and loss, coupled, if possible, with free fishing for themselves and an occasional friend. Their notion is, that the greater the rent they can obtain and the smaller the amount they have to expend, whether on keepers, weed cutting, stocking, or other necessary work, the larger is their profit. They seem to overlook the fact that the effect of this policy must be, in the end, to kill the goose that lays the golden eggs.

Opponents of artificial stocking.

There are even now, at the end of the nineteenth century, a few who honestly believe that putting artificially-bred fish into a river has some dreadful and inexplicable effect on the old inhabitants of the stream; in fact, some go so far as to say that, if not the chief, this is one of the chief causes of the serious and progressive decline in sport during the last few years. If

their argument went no further than to allege that trout bred artificially and fed in captivity did not, when left to shift for themselves, take to fly or surface food, it might, although contrary to the experience of pisciculturists, have some weight. When, however, on this frail foundation they try to build up so colossal a superstructure as the statement that the trout already in the river—born and bred there and used to find their own food—in some way catch the complaint and cease to feed on insects, the very extravagance of their assertion proves the weakness of their case.

It is said that this stocking, or, as some say, overstocking, with tame fish is producing an artificial state of things, but it is too late to advance this argument. The necessity for such stocking is brought about by an even more artificial state of things—viz., that of having thousands of anglers frequenting waters that are not fairly capable of accommodating a tithe of their number, and still further aggravated by the spread of dry fly, by which every rising fish on every day in the season is more or less educated by the sight of artificial flies floating over him. It might be urged that this education is of itself a partial remedy to the over-fishing from the fact of its decreasing the number of fish killed. However, modern improvements in artificial flies

and superior skill on the part of the anglers themselves have fully kept pace with the education of the fish, so that the total number of fish killed has largely increased, although probably each individual does worse and gets less sport.

Reply to objections.

To the proprietors of fisheries who say that their waters do not require stocking, as there are plenty, or even too many, fish already in the stream; to those who argue that the natural increase is more than sufficient to counterbalance the loss by the fisherman's captures and other causes, I would respectfully proffer the advice not to waste their time by reading this chapter. They have no desire to be convinced of the possibility of their being mistaken. To those who consider the question from the view of being desirous to save their pockets, who are generally gifted with the convenient faculty of being able to prove to their own satisfaction the truth of any theory they wish to believe, I would counsel a study of the two following paragraphs. It is barely possible, although unlikely, that they may thereby be induced to believe that, even from a financial point of view, stocking a stream judiciously is likely to prove successful.

The Wilton Fly Fishing Club.

In the year 1890 the Hungerford Club resolved to abandon their old water on the Kennet. After considerable trouble their

respected honorary secretary (Mr. H. Collins) succeeded in finding and obtaining a lease (which they gladly adopted) of upwards of ten miles of the river Wylye. It extended from about half a mile above the village of Steeple Langford to the town of Wilton, and the name was accordingly changed to the Wilton Fly Fishing Club. On this length of water everything had been neglected. The shallows had not been cleaned; the weeds were cut or not according to the fancy of the millers and farmers; pike and coarse fish had been allowed to increase and multiply; poachers had worked their wicked ways unchecked; and, it is perhaps needless to add, no stocking had been attempted.

Systematic killing down of pike and other coarse fish amounted in the aggregate for the years 1890, 1891, 1892, and 1893 to no less than 3619 pike and 13,056 other coarse fish. Stocking was during the same period carried out on a most liberal scale, over 4000 trout of two years old and upwards, over 16,000 yearlings, 45,000 fry, and 24,000 ova having been introduced, as well as 534 grayling (averaging 1¼lb.), 500 yearlings, and 35,000 ova.

Here was a typical case of a thoroughly neglected chalk stream, the value of which, in its then depleted condition, was quite nominal.

Four years of good management, and an apparently somewhat lavish expenditure on introducing new stock, produced a length of water so improved, and on which the sport was so good, that although both the subscription and entrance fees are high, not only has the club its full complement of members, but there are in addition applications for membership from more anglers than in the ordinary course of events are likely to be elected in the next five years. At the same time, a very substantial rent has been paid to the proprietor, who before this received nothing for the water, and considerable sums of money are brought into circulation in the surrounding villages by the members.

The natural system.

Although I am not one of those who are persuaded that what is called the *natural system* alone will suffice to keep up a head of fish equal to the demands of the modern sportsman, yet I should be the last to deprecate in any way the policy of doing everything possible to encourage the natural reproduction of a river. Although it is well known that the percentage of ova fertilised in a state of nature is very small, and of those hatched out even smaller, and that of the resulting alevins and fry only a minute fraction will escape the ravages of their numerous enemies to arrive at maturity, yet, for what it is worth, they are free

from the supposed taint of artificial feeding and artificial breeding.

Advantages of introducing fresh strain.

The majority of modern pisciculturists are of opinion that natural reproduction is of minor importance as compared with the benefits accruing from turning in artificially-hatched trout. It may be argued that it is so manifestly to the advantage of the fish breeder to encourage the purchase of store fish for stocking, that his opinion on this point must be accepted with a certain amount of reservation. Experience however goes to prove that where no fresh blood has been introduced for many years, the trout are in worse condition, and give less sport, and that in such cases stocking with a new strain is invariably productive of good results in subsequent generations. To this extent we are all in accord with the pisciculturist; but when he attempts to summarise this in the statement that the natural spawning of the trout in the river is a *quantité negligeable*, we at once join issue with him. The stock of fish in a river cannot be adequately kept up, either in quantity or quality, without turning in fish purchased from outside sources, but at the same time the successful deposition and fertilisation of the indigenous ova, as well as the hatching out and growth of the young trout, should be in every way fostered and encouraged.

Effects of pollution.

The ideal conditions required for a spawning bed are well known—a good and continuous supply of pure water, not varying greatly in temperature, and flowing at a good pace over a clean, bright, sharp, gravel shallow. The supply of pure water and the shallows fit for spawning beds are present in almost all chalk streams; but unfortunately the hand of man has too frequently, in what he calls the march of civilisation, completely revolutionised the conditions. First, there is a village on the stream, in which the population gradually increases; then some so-called system of drainage is taken in hand, resulting in the poisoning of the river and fouling of the water.

The mischief does not even cease here, as the presence of sewage stimulates the growth of certain forms of sub-aqueous vegetation, usually the forms least desirable for the food supply of the fish. These weeds choke up the stream, and collect around their roots and stems every particle of earth held in suspension by the water. The weeds in time rot down and become mud, adding to the stratum already deposited in the stream, until at length the bright, fresh gravel is covered to a thickness of many inches with filthy black mud. Any eggs deposited on this mud, if by chance fertilised, rarely hatch out, and when they do the

alevins are weakly, and seldom survive to reach the fry stage.

Although numerous Acts have been passed to cope with this question, they seem of little avail to check pollution. In fact, until some positive epidemic directly traceable to the use of impure water breaks out, and draws public attention to the scandal, the pollution Acts are worse than useless. The only resource for an unfortunate lessee of fishing is to counteract the evil as far as he can by cutting down the weeds as closely as he can in the autumn, clearing out as much mud as he can afford, and raking over all gravel shallows to keep them clean. If the poisoning of the river proceeds from a paper mill, skin mill, or other manufactory, he has the pleasant alternative of throwing up the sponge or of embarking in a lawsuit. If he adopts the latter alternative, he does so with the certainty of incurring heavy costs in any event, and ruinous ones in the not improbable one of being unable to prove his case.

Difficulty of estimating number of fish spawning.

The weeds being cut, the shallows clean, and the ova having been deposited, the fry must be protected until they are large enough to shift for themselves. Ducks (both tame and wild), water fowl, adult trout, kingfishers, larvæ of various beetles and insects—in fact, all the enemies of the trout—must be kept down, and beyond this

there is nothing that the keeper can do of much avail towards assisting the work of natural reproduction. It is perhaps of use for him to keep some record of the numbers spawning in successive seasons. It is, however, most misleading for him to report that so many pair of fish are spawning on a particular shallow. He forgets or is ignorant of the fact that every female fish on a spawning bed is attended by at least two or three males, and in waters that are heavily fished by as many as six or eight; this apparent anomaly is due to the fact that, in heavily fished waters, the percentage of male and female fish killed is not, as might be supposed, equal, the females falling victims to the fly being far more numerous than the males.

Another point, too, very often overlooked is that a female, having once deposited her ova, retires from the redd for the season, while a male, having shot his milt, will in a few days accumulate a fresh supply, and be available to fertilise ova from later-spawning females. By the system of counting, these males are thus reckoned over and over again. Some approximate idea can be obtained by counting redds; but here again it must be remembered that a number of female fish will spawn so close together as to make apparently a single redd, so

that the count even in this case cannot be considered anything like accurate.

In addition to encouraging as far as possible the natural reproduction of the river, it must be taken as proven that stocking by turning in trout obtained from some outside source is necessary in a stream which is in any way heavily fished. A few may be caught or procured from neighbouring streams, but the aggregate number to be thus obtained is so small, and the risk of encouraging poaching on one's neighbours' waters, by buying them indiscriminately, so large, that practically no resource is open, except that of buying from a pisciculturist, or starting a hatchery oneself.

Various breeds of trout for stocking.

Of the species or varieties, the American brook trout (*Salmo fontinalis*) is a very handsome fish, grows to a good size, but has not, in this country, proved suitable for stocking rivers. It is really a char, has a strong instinct to work down stream, and where introduced has generally been lost after a few seasons. Fish-culturists have succeeded in breeding a hybrid between this and the ordinary English trout (*S. fario*), of which great things are predicted, but the matter has not yet progressed beyond the experimental phase. The rainbow trout (*S. irideus*) is another American species, which may prove as game as it is striking in appearance.

The Loch Leven trout (*S. levenensis*) is much praised where it has been tried, and has succeeded, but whether this species (or, according to some authorities, variety) of the ordinary trout will eventually be the favourite for stocking south country waters is, at best, doubtful. The ordinary English trout (*S. fario*) is probably the best of all, and, if carefully selected from good strains, it is, under favourable conditions, certain to produce satisfactory results. It is said that the question of breed is not of paramount importance, although all of us have predilections for particular strains. Personally, I prefer Wycombe trout to any other, but unfortunately these are no longer procurable in any numbers, and the stock of fish in the lower part of the Wycombe stream has been so frequently decreased by accidents and pollution that the local association has, I believe, turned in store fish of other blood.

Importance of size in parent stock.

It is, at any rate, essential that the parent stock should not be a race of dwarfs, although whether the offspring of 7lb. or 8lb. trout will, under similar surroundings and with an equal supply of the same food, grow to a greater weight than the progeny of the more ordinary breeding fish of say 1½lb. to 2½lb. is a question worth proving by experiment. The leading pisciculturists are fully alive to the importance

of breeding from healthy, vigorous, well-conditioned, and large fish. They are also aware of the dangers of continual inbreeding, and therefore never lose an opportunity of introducing into their ponds trout of good strain that they can purchase.

Amateur hatcheries.

Stocking can, of course, be carried out by establishing a regular hatchery with troughs, water supply, &c., either taking eggs from the indigenous trout or purchasing them from a pisciculturist, hatching them in troughs and growing them up to any size required. Many amateurs have tried these experiments, but most have failed from some cause or another. Some have taken the ova from their own fish, and been discouraged by the ever-present difficulty of finding female and male ripe at the same time. Some, having taken the ova and carefully deposited them in the hatching troughs, have been amazed to find that the water was not sufficiently pure or the supply not sufficiently constant, and hence the result obtained has been too poor to warrant their continuing the experiment. Some, again, have hatched out a fair proportion of the ova and then been alarmed at the mortality at the commencement of the feeding stage.

Ponds for growing yearlings.

Some, having overcome all these difficulties, have proceeded to construct ponds as to which

they have built up visions of raising tens of thousands of large yearlings, and not only stocking their own streams to repletion, but even competing with the professional pisciculturists and selling sufficient to accumulate a considerable reserve fund for future operations. The results have not warranted such sanguine expectations. Relying on the distinct assurance of the oldest inhabitants of the district that the springs bubbling forth from the ground had never visibly decreased even in the hottest and dryest seasons, the site of the projected ponds had been chosen and the ponds dug. Yet the very first summer after they had been made and fully stocked with healthy fry the flow of water slowly but surely dwindled away to a mere dribble, or possibly failed altogether.

Distracted at the impending loss of their young trout, the experimentalists have erected pumps driven by steam power, or by a small windmill, or even by hand labour, and succeeded in raising from the springs below sufficient water to keep a small flow into the head of the ponds. Gradually the surface of the water has become covered with a filthy green slime, and the daily count of dead trout has left no doubt that the expected tens of thousands have been reduced to hundreds, and these not of the largest or healthiest looking. At length, after a dismal

counting of the cost, the ambitious amateur has, as a rule, abandoned the experiment.

For the information of anyone desirous of carrying out these experiments, the following statement, made by the late Mr. Thomas Andrews, of Guildford, perhaps the most successful pisciculturist of the century, may be of interest and of use. He said that, with all his experience, with every necessary appliance, with a full staff, and by devoting practically the whole of his own time to supervising the work, he could hatch out eighty per cent. of the ova he took, and raise twenty-five per cent. of his fry to yearlings. In other words, under the most favourable conditions of artificial hatching and rearing the fry in captivity, giving them an ample supply of the best food procurable, out of one hundred over eighty healthy fry can be expected to hatch out, and only twenty of these live to become yearlings. In a state of nature the proportion of ova fertilised and hatched out would only be a fraction of the above percentage, and it is estimated by the same competent authority that out of one thousand naturally hatched fry in a river not more than one is likely to celebrate the first anniversary of its birthday.

Methods of stocking.

Having determined that the plan to be adopted is to purchase from a pisciculturist,

there are four methods of stocking, any one of which, under favourable conditions, may, in a longer or shorter time, prove efficacious. They are: Firstly, by means of eyed ova, planted in suitable portions; secondly, by fry turned into the stream itself, or into carriers properly fenced off; thirdly, by yearlings; and fourthly, by two-year-olds, or even larger trout.

Eyed ova.

When the fish breeder has spawned the female trout, the eggs being deposited in a dry dish, a small quantity of milt from a male is expressed on to the dish, and the eggs and milt are mixed by tilting the dish gently backwards and forwards. They are, after a few minutes, put into a vessel of water and thoroughly washed, until every trace of cloudiness caused by the presence of superfluous milt is removed. The eggs are then deposited in the hatching troughs, and the following day all opaque or unimpregnated ones are picked out, and from time to time during the period of incubation this process of removing opaque eggs is repeated. After the lapse of a certain number of days, varying according to the temperature of the water, the ova will have arrived at a stage of development when two dark spots are distinctly visible. These dark spots are the eyes of the embryo within the egg, and at this stage the eggs are called eyed ova.

Stocking with eyed ova.

When attempting to stock with eyed ova, they should be planted on artificial redds made on bright gravel shallows, in such places as those described in a previous paragraph as suitable spawning ground. The conditions under which success may be anticipated are where there are practically no fish of any sort in a stream, but where, nevertheless, the water is unpolluted, or where suitable tributary streams or carriers can be found. Such carriers must have a continuous supply of pure water, and, after being emptied of all fish previously contained therein, be securely fenced off at the upper and lower ends.

Even under these conditions it is doubtful whether the plan can be recommended as economical. It is true that eyed ova can be purchased at a low price, but the number required for stocking anything like an extensive fishery would be enormous. Besides, the certainty that at best only a small percentage will hatch out, and that the presence of sewage or other contamination, even in small quantities, will be sufficient to prevent their hatching at all, there are many elements of danger. Then the alevins are very helpless, and are devoured by a great variety of predaceous aquatic larvæ, as well as all the other numerous enemies of the *Salmonidæ*. The accidental formation of con-

fervoid growth, or fungus, or the smallest degree of overcrowding, will prove fatal to them at this stage, or at least only leave stunted, deformed, or diseased fry, which are worse than useless. Even under the most favourable conditions, stocking with eyed ova cannot produce sizeable trout in less than four years.

Stocking with fry.

Stocking by turning fry direct into a river should never be attempted. If there are no fish —a very unlikely contingency in a stream fit for trout—eyed ova are preferable as being rateably less costly. If there are trout or pike they are sure to attack the fry when first cast adrift, and, having once tasted blood, are not likely to leave them as long as there are any alive. Then, again, the natural mortality among fry during the first few months of their lives is quite appalling. Even in the pisciculturists' ponds, where every hatch is doubly guarded by zinc fences with the smallest perforations procurable, where experienced men are daily employed in keeping these fences clear of confervoid or other vegetable growth likely to choke them up, where the smallest appearance of a blow is remedied at once, the number that escape is incredible. These are only recovered by an elaborate series of hatches and fences between the outlets of the ponds and the limits

of the breeder's water, each one of which is an important link in the chain.

If the fry can be turned into properly fenced-off tributaries, only some of the difficulties have been removed. Although there may be a fair quantity of natural food in such tributaries, it is not likely to be enough to feed them liberally in a comparatively restricted space, and, without an ample food supply, the fry will certainly not grow into healthy and fair-sized yearlings. Artificial feeding will hence have to be resorted to. Here, again, every fish breeder in the country will confirm the statement that the most anxious time with him, and that at which the greatest mortality occurs under normal conditions, is when he is just getting the fry to feed.

Stocking with yearlings or two-year-olds.

Yearlings or two-year-olds are probably the best store fish to introduce into a river already containing any number of trout, and their respective advantages and disadvantages may be briefly summarised as follows:—Yearlings are far less costly than two-year-olds; they are fairly well able to take care of themselves and avoid the ravages of their elder brethren. A pike, lying deep down in the water, almost covered by weeds and perfectly motionless, can see every movement of a trout above him on the look-out for floating or partially-

submerged food. One quick stroke with the tail, a dart upwards, and the unfortunate little *Salmo fario* is across the pike's cruel jaws and swallowed almost before it realises the danger. Now, as a pike of eight or nine inches in length can gorge and digest a five-inch yearling, obviously where the small pike are very plentiful the yearling is not to be recommended for stocking purposes.

Two-year-olds.

Two-year-old or larger fish are of course, owing to their greater size and strength, better able to keep out of harm's way; but, besides the prime cost, they are more difficult and more expensive to move. The heavy mortality during transit, except in the coldest weather, is a serious addition to their cost. In a stream where the stock has been allowed to run down very low, they are preferable, as being one year more advanced towards maturity, and therefore likely to reproduce one year sooner than yearlings. On the question of adapting themselves to their novel surroundings, and finding their own food, there is, perhaps, not much to choose between the two-year-olds and yearlings.

Keeping yearlings in a stew for one year.

Altogether, if expense is no object, two-year-olds should be selected; but if, from motives of economy, yearlings have to be used, they should, as far as practicable, be turned into the stream on a shallow where pike and large trout

are not plentiful. Perhaps the best plan of all is to make a stew in which the yearlings can be kept for a year. By feeding them liberally, they will grow to good-sized two-year-olds, and when turned out will be quite able to take care of themselves.

Pisciculturists' price lists.

Having determined to purchase yearlings, a very short study of the price lists of the various trout breeders will show a considerable variation in the quotations. One will quote yearlings as low as £10 a thousand, while another will price them as high as £30 for the same number. Where quotations vary so much, it is only natural to infer that, provided no one is trying to cut out his competitors by asking an abnormally low price, there must be considerable variation in the yearlings. A careful examination of the fish themselves will confirm this hypothesis; some of the lowest-priced yearlings will be found to average something like three inches in length, and be composed of a few full-sized individuals of, perhaps, five inches, among a mass of two and a half inch and three inch ones, with a sprinkling of puny little things of only about two inches in length. The highest-priced yearlings will have been properly sized; *i.e.*, all palpably undersized will have been rejected and returned to the ponds, to be fed up and kept another year, and those

delivered will be a fairly level lot of, say, five to seven inches in length.

Comparative value of store fish.

The comparative length does not convey any adequate idea of the real difference in size, and the following figures, being positive weights of fair specimens, may be given:— Trout, $3\frac{1}{8}$ inches long, weighed ·17, or $\frac{17}{100}$oz. One 4 inches long, ·40, or $\frac{4}{10}$oz.; 5 inches, ·68, or $\frac{68}{100}$oz.; 6 inches, 1·3, or $1\frac{3}{10}$oz. All these were yearlings prepared for travelling, *i.e.*, starved for five or six days; and as the figures show that, for example, a 5-inch yearling weighs four times as much as one $3\frac{1}{8}$ inches in length, the comparative value can be easily calculated. In the absence of any reliable data on the subject, it is nonsense for any fish breeder to assert that the smaller yearling will develop into a heavier two-year-old, or adult fish, than the larger one. The largest and sturdiest yearlings are the best fed, and having the better start in life are, other things being equal, likely to develop into adult trout of greater size, healthier and gamer than their half-starved brethren.

CHAPTER IX.

THE STEW.

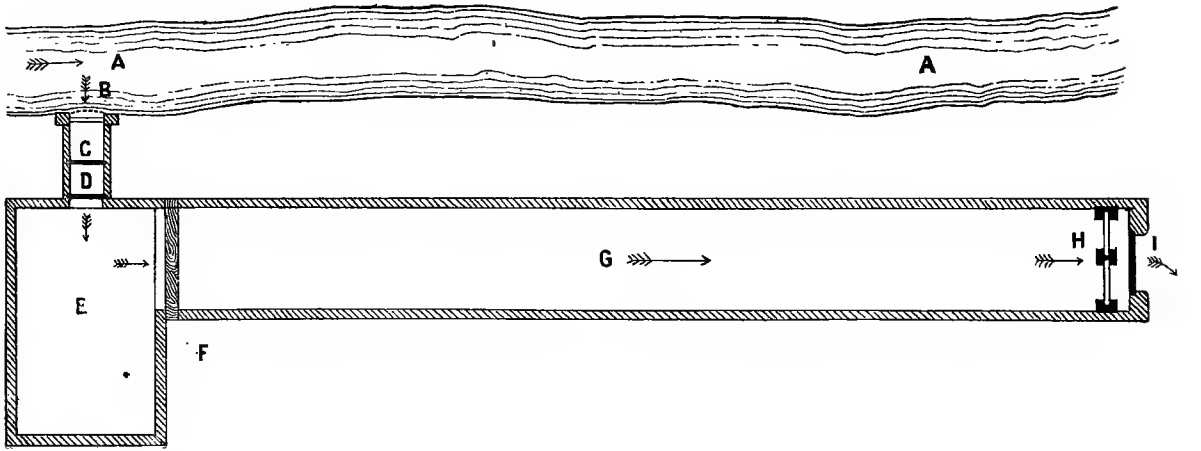
IF the plan of purchasing yearlings, keeping them in captivity for a year, and feeding them liberally before turning them in be adopted, a stew must be arranged to carry out this work. Any carrier which can be emptied so as to remove all its fish, and securely fence off both ends, would be available for such purpose, the only necessary condition being that the water supply is ample and continuous and that the control of the water level is in the hands of the fishing lessee. If there is no carrier fulfilling these conditions an artificial cut can often be made across a sharp bend of the river with hatches at the upper and lower ends. Of course a properly-constructed stew is preferable to any such makeshift, and the following description of one which had been constructed many years since, probably for the purpose of keeping a few live fish for the

table, will serve to indicate a good and efficient type. It must be noted, however, that the fall of two feet at the inlet hatch mentioned later gave special facilities for the purposes of adaptation to the requirements of a stew for growing yearlings to two-year-olds. The necessary repairs and additions of hatches, perforated zinc fences, &c., had to be carried out at the expense of the lessee.

Description of a stew.

In the accompanying plate of the plan of this stew the water supply is derived from a carrier marked A A, running nearly parallel to the course of the main stream. The water supply in this carrier is constant, and it had been consequently selected to provide the motive power to a turbine or other mechanical arrangement for pumping water to the manor house on the estate for domestic purposes. At the point B a substantial hatch is fitted with a small weed rack in front, constructed of piles driven into the bed of the stream. This inlet hatch, 4ft. deep and 2ft. wide, leads to a cross channel cut through the ground, and is covered by oak boards with a trap-door opening so as to give access to the interior of the channel. At C a screen of oak framing, to which a sheet of perforated zinc is fastened, works in a square groove cut in the sides and bottom of the inlet channel. At the further end of this channel

PLAN OF A STEW.



(D) a second and similar screen is fixed immediately against the side wall of the shed at the upper end of the stew.

The shed E—20ft. long by 12ft. 6in. wide—is a substantial brick structure with tiled roof, and the water from the inlet channel runs into it under the flooring of the shed itself. In the flooring of the shed two large trap-doors are fitted to give access to the tank or water space under the shed. The bottom of this tank is bricked and the sides rendered with cement. The water, turning at right angles to the inlet channel, then passes out of the house, under the plank bridge marked F, into the open air, and proceeds in a direction parallel to the supply carrier down the stew itself. The stew itself (G) is rectangular in shape, constructed of brick throughout, with upright side walls. At the point H a solid oak frame, with central post, is grooved to receive two perforated zinc screens in oak frames. The outlet hatch, also of solid oak, is fitted at I.

From the outer wall of the shed at F to the fence at H, the stew is 85ft. long, and its width is 9ft. 6in. inside from wall to wall. The bed of the stew throughout is covered with a thick layer of good hard gravel, rammed down solid. At the inlet hatch there is a fall of about 2ft., and in the length of the stew a fall of about 1ft.

The level of the brick floor of the tank under the shed is above 6in. below the level of the bed of the stew, so that this depth of water is left in the tank when the stew itself is empty. This is, however, as will be noted further on, a disadvantage when collecting the fish for turning out or other purposes.

Attention is directed to some of the details of the arrangement. As already stated, there are between the inlet hatch B and the shed C two securely fitted, perforated zinc fences, and in front of the outlet hatch I there is also a securely fitted fence in two halves, H. There is also a second outlet fence, which is fixed at the point I, when the hatch is raised to empty the stew. Thus, whenever it is necessary to remove a fence in order to clean it from accumulated leaves, weed, confervoid, and other rubbish, there is in front, or behind it, a second fence to prevent the escape of any fish.

The tank under the shed E being the darkest, deepest, and least disturbed portion, the largest fish congregate there, and when the stew is emptied all the trout fly to it for safety. Thus, in case of an attempted raid by poachers, the yearlings would take refuge in the house, and, as this is securely closed above water by a strong door, and below by iron bars about 4in. apart, fastened to the brickwork, the

poachers could not gain access to the shed itself. Whenever the keeper is about to feed the yearlings, he lowers the level of water in the stew until all of them are in the tank under the shed, and then distributes the food through one of the trap-doors in the flooring. Sufficient light comes in by the open door of the shed and the window to admit of observation of the fish while being fed. The only disadvantage of this plan is that, when the stew is emptied for the purpose of catching the yearlings, the small quantity of water left in the tank has to be bailed or pumped out.

The level of the water in the stew is of course dependent on the arrangement of the various hatches. Thus, with the inlet hatch fully open, and the screen at H down to the bed of the stew, the flow of water is very rapid, and the average depth of the stew is about 20in. With a 12in. board below the screen at H, the depth of water can be raised with safety to about 2ft. 6in., but in such case the inlet hatch is not so much raised, and the stream through the stew is less rapid.

Necessity for securing hatches, &c.

All hatches, screens, &c., have, of course, adequate arrangements for raising and lowering, and, what is a matter of paramount importance in such cases, staples, bars, and padlocks are provided, so that the entrance to the shed, and

all hatches, screens, &c., are secured, and can only be opened, closed, raised, or lowered by the keepers who have the keys. Great care is taken that any appearance of a "blow," *i.e.*, the working away of minute particles of earth from the upper to the lower level, should at once receive attention and be repaired. A "blow" invariably indicates the presence of a small opening, and naturally the action of the water tends to increase the size of such opening very rapidly. It is surprising how small is the opening through which yearlings or other store fish can make their way, and escape.

Kingfisher traps, and barbed wire to prevent netting.

The head keeper should enter in his book, or diary, an accurate record of the number of fish turned in; also of any found dead from time to time; and the number taken out when the stew is emptied should show only a small percentage unaccounted for. A series of stakes driven firmly into the soil, projecting 6in. or 8in. above the surface of the water, with kingfisher traps set on them, prevent these pretty but most destructive birds from levying toll on the trout. Barbed wire stretched across diagonally under water from post to post is designed to thwart the nocturnal visits of poachers with nets.

Necessity of shade.

A stew should be in a shady position among trees, and with a good flow of water through

it. In the hottest summers the development of bright green scum, which is a confervoid growth, will not then be encouraged. An occasional raking over the bottom, followed by a temporary raising of the inlet hatch so as to admit more water, and a simultaneous removal of the outlet hatch, to give it a thorough sluice out, keeps the gravel clean and bright. Every part of the stew being in thorough repair, it is only necessary to empty it throughout, and keep it empty for at least a full fortnight, to render it fit to receive the yearlings with every prospect of their thriving and growing into large and well-proportioned two-year-olds.

Two seasons' experience of stocking arrangements with the stew described have given an insight into its strong and weak points which may be of advantage to students of the question, and hence I purpose giving the results somewhat in detail. As a commencement, 1000 of Mr. Andrews' largest yearlings were turned directly into the river in the month of April, 1893, without the loss in transit on this occasion of a single fish. A second and similar batch of 1000 were to follow about a week later, of which one half were destined for the stew, and the balance to be at once consigned to the river.

A *contretemps* in moving yearlings.

The yearlings left Mr. Andrews' hatchery, at Guildford, in the early morning, an experienced attendant travelling with them to give fresh water when required. On their arrival at the nearest railway station, about six miles from the stew, it was discovered that, in place of the wagonette and pair of fast horses ordered, a cart and slow-paced horse were in attendance. The excuse advanced by the livery-stable keeper that, there being a fair or market in the village, he could not spare the wagonette and pair, was as inadmissible as the results were disastrous—the more inadmissible, as he had had previous experience of moving live fish, and presumably had some idea of the danger.

It was a close day, and some of the yearlings were on top of the water in the cans, showing signs of exhaustion, on their arrival at the station. However, fresh water seemed to revive them, and the only prudent course was adopted, to push on and change the water as often as possible. The cart was driven as fast as the wretched horse could get along, but arrived at the stew quite two hours later than expected, and I was on the spot myself, awaiting its arrival in a state of great anxiety.

A word from Mr. Andrews' worthy representative put me *au courant*, and the order was given to turn all the yearlings into the stew

without a moment's delay. With the assistance of the keepers and some labourers at work in an adjacent meadow, this did not take many minutes, and yet it was not at all too soon. Seventy-six were dead and stiff, and after a considerable amount of care and nursing we managed to keep all the rest alive, except twenty-five, so that 101 out of 1000 succumbed. Another half hour would have killed every one of the fish, and caused a serious loss, brought about not by any want of organisation or forethought, but by the accidental coincidence of the unseasonably hot weather and the neglect of the livery-stable keeper to send a conveyance and horses fit for the work. It is only fair to add that the late Mr. Andrews himself wrote the next day to the effect that he intended to send another 100 yearlings to make up the deficiency, an intention which was duly carried out a few days later. Four hundred of the largest were turned into the river, and the remaining six hundred left in the stew.

Nature of food for yearlings.

The question of feeding, and of the nature of the food to be given to the yearlings in the stew, is of the greatest importance, and a primary factor in determining the rate of their growth during the period of their detention under these artificial conditions. Fish breeders are in the

habit of feeding yearlings on horse flesh, either raw or partially cooked and passed through a mincing machine; or on scalded mussels or other mollusks from the sea or fresh water; on bullock's liver and lights, also passed through a mincing machine; or on other animal food easily procurable in the district. A species of biscuit similar to the ordinary dog biscuits, soaked and broken up, is also occasionally used. In the opinion of the majority of experts, however, although convenient in case of emergency, or failure of the supply from the usual sources, the biscuits do not contain as much sustenance, nor do trout fed on them thrive as well as those brought up on the other forms of food mentioned.

Some pisciculturists say that a judicious alternation, or even mixture, of minced horse flesh and mussels, those from salt water being preferred, produces the best results. Some object to the diet of liver and lights, as tending to make the fish dark in colour. Others, on the contrary, argue that the dark colour is due to the trout being kept in comparative shade, and is only temporary, because a dark, well-conditioned fish kept for a short time in a strong light will become bright and silvery. In the case of our yearlings, there being no kennels in the immediate vicinity from which a regular

and reliable supply of horse flesh could be procured, it was decided to keep a small reserve of biscuits in case of accident, and try the experiment of feeding on liver and lights, delivered twice a week by the local butcher. An inexpensive hand machine for mincing the food had already been fastened to a well-secured table in the shed at the upper end of the stew, and it was with feelings of some anxiety that the first experiments of feeding the young trout were made.

First attempt at feeding.

A small quantity of the liver and lights having been minced up, and the trap-door in the floor of the shed over the water having been opened, while the door of the shed itself was kept closed so as not to admit an undue quantity of light, the head keeper commenced quietly dropping a little of the finely minced food into the water. He was alone in the shed, and took care to keep as still as possible. These precautions were taken because it is found that yearlings, after being moved into fresh quarters, whether from the jolting on their journey or fright at the strangeness of their new surroundings, are occasionally so scared as to refuse food, and quickly go back in condition. With wild fish this would not be altogether surprising, but with yearlings hatched artificially, and reared in ponds where from the

first they had been regularly fed, it is, to say the least, unexpected, and tends to show how little the natural instincts of the trout are affected by the seemingly unnatural methods of the pisciculturist.

Educating to surface food.

At first the food drifted down unnoticed; presently one troutlet bolder than the rest would dart up and take up a small quantity; gradually others would follow suit, until in a few days all of them would feed freely. When this was reported to me, I arranged to assist at the next evening's meal, and was most gratified to see how admirably everything worked. As soon as the mixture of minced liver and lights fell on the water, I was, however, astonished to see that, instead of sinking like the horse flesh and mussels, it floated, and remained on the surface as far as the eye could see. At once it occurred to me that if there is anything whatever in the theory that feeding fry or yearlings on meat tends to teach them to seek their sustenance under water, and make them bottom feeders, this particular form of animal food must educate them to come to the surface.

If anything could make artificially bred and artificially reared trout surface feeders, it should be such treatment as this, and, unless the whole education theory is fallacious, should produce a new generation of more freely rising fish than

even the naturally bred denizens of the river. The major portion of the food of the indigenous fish is undoubtedly in the form of shrimps, snails, caddis, and other larvæ, which are invariably found among the weeds in mid-water or at the bottom, while the floating winged insects on the surface are occasional delicacies taken freely under only exceptional circumstances. This discovery so impressed me, that I decided at once to continue this form of food as long as possible, and in as great a quantity as the yearlings would take it. In respect to the floating of the food, it must be noted that the liver alone sinks and the lights alone float, but the latter are deficient in sustenance. They should therefore be mixed in the proportion of not more than two parts of liver to one of lights.

Symptoms of overfeeding.

In respect to the quantity of food to be given to young trout in confinement, the quantity of shrimps, snails, caddis, larvæ of Ephemeridæ, and other natural food need not be considered unless the size of the ponds is out of all proportion to the number of fish contained in them. So long as the trout come eagerly to the food, and the whole of the minced meat given is devoured at once, they are not being overfed, but if the fish cease feeding before all the food is consumed it may be assumed that the supply is excessive. They should commence feeding

immediately the food is thrown in, unless there are strangers present, or any other unusual condition likely to frighten them. If the particles of food are left floating about on the surface, or if they sink to the gravel, which will happen even with the mixture of liver and lights when thoroughly sodden, the quantity must be diminished. Should this precaution be neglected, the water will become contaminated by the decomposing animal matter, and serious mortality ensue.

Quantity of food.

The 600 yearlings in the stew from the end of April to the end of July, 1893, took 10lb. of liver and lights per week. They had two meals daily—one early in the morning and the second at or about dusk; and they grew rapidly, and were in the best possible condition. Finding that a certain proportion of the yearlings had grown much faster than the rest, and that being larger and stronger they got more than a fair share of the food at the expense of the others, and in view of the risk of their preying upon the smaller fish, it was decided to turn them into the river. On July 26th about 160 of the largest were accordingly transferred to a favourable reach of the main stream.

The same allowance of food was given to the remainder, and in a few days this was increased to 12lb. per week, and as every particle of it

was eaten long before it had floated down to the perforated zinc fence at the lower end of the stew, it was evident that even this largely augmented supply was not too much. The effect of the increase of food was surprising, and the trout grew so rapidly that it was a constant source of regret that it had not been given at an earlier date. This is a difficulty encountered even by the most experienced trout breeder. He finds that the fish, whether fry, yearlings, two-year-olds, or adult, seem to improve in condition and grow more rapidly as the quantity of food is increased, until in time he begins to fancy that it is impossible to overdo it. Generally about this period, however, the memory of disastrous results from overfeeding in former years prompts him to exercise extreme caution, and stop the experiment in time before the first symptoms of poisoning the trout by decomposed food and foul water make themselves visible.

On November 30th 130 of the largest remaining fish were again taken out of the stew and turned into the river, and of these the three largest measured 11 inches in length and $6\frac{1}{2}$ inches in girth, three more measuring fully 10 inches in length and 6 inches in girth, and the majority were from 9 inches to 10 inches long, very few being under the 9-inch standard.

It must be remembered, too, that these were not the best of the stock, as already, on July 26th, the largest had been drafted off. Now, as they were the produce of eggs taken by Mr. Andrews, at Crichmere, not earlier than the end of November, 1891, and hatched somewhere about the fourth week in January, 1892, they were nearly two months short of two years old, and the rate of growth in the stew must be considered highly satisfactory.

Results of first year.

From this date the food supply was reduced to 8lb. per week, not altogether because of the smaller number of fish in the stew, but because previous to and during the spawning season no trout yearlings or adults feed well. On the 10th and 18th January, 1894, the stew was emptied, and the rest of the young trout, 214 in all, were turned into the river. On reference to the figures, it appears that 160 were turned out on July 20th (this number is only approximate, because, owing to the heat of the weather, it was not safe to keep them out of running water long enough to make an accurate count), 130 more on November 30th, and 214 in the month of January—or 504 in all, leaving out of the entire 600 about 96 unaccounted for. This must be taken as representing the casualties from all causes during nine months, and although at first sight the percentage seems

high, yet I am assured on the best authority that, for the first year, the result is most gratifying. The presence of a certain number of kingfishers had no doubt something to do with this loss, and loath as every lover of nature must be to destroy these interesting and graceful birds, yet when their rapacious appetite for smaller trout is considered, one is constrained to limit as far as may be the mischief resulting from the presence of too many of them in the immediate neighbourhood of the stew.

Preparation of stew for second year.

The young trout having been removed from the stew, it was run down as low as possible and all the water baled out of the deep portion under the shed. It was then kept dry for nearly a month, and looked over from day to day so as to remove any possibility of a single trout having been left in it. The result of such an accident would infallibly be that the next season's stock of yearlings would have served as a very costly form of food for the single two-year-old left behind. A case in point happened to Mr. Andrews. A two-year-old jumped out of a can into a large pond of fry, and being taken out a year later weighed over 5lb., while the deficiency on the expected number of yearlings from that pond was not less than 35,000.

A minute survey was made of the stew, all defective hatches and their fittings were re-

paired, new perforated zinc was fixed to all the fences, and the wood and zinc cleaned, and painted over with tar varnish; the brickwork was repaired, and some parts of it renewed where the action of the water had rendered it unsafe; the cement-work throughout was repaired; the gravel raked over, thoroughly cleaned, and rammed down hard; in fact, everything requisite was done to put it in fit and proper condition to receive a fresh lot of yearlings for future stocking. As a last, but very necessary precaution, the water was run through it for a fortnight to make sure of removing any possible risk of unslaked lime being left in the cement or joints of the brickwork.

The stew in 1894.

A friend fishing the water, as the guest of one of the lessees, expressed a desire to present 1000 yearlings to the fishery. He explained that a relative had erected and fitted up a small hatchery, taking the ova from a strain of large trout, and had arranged a series of small carriers in which some good yearlings were reared. This kind offer was accepted, and on the 27th February, 1894, they were conveyed to the water, and with the exception of five, which had succumbed during the journey, were turned into the stew. On the following morning ten more were found dead.

Altogether they were a very useful lot of

store fish, but not so level as I have had. Some few were rather small, and a fair number extra large, but the great bulk were not less than five inches in length, and quite equal to the yearlings sold by the leading pisciculturists. Fish delivered by amateurs never show equal to those sent out by professionals, as the latter follow the plan of sizing them by the length and charging accordingly. Thus 1000 six-inch yearlings would be priced at £25 or £30, while four-inch fish would be about half the price, and the quite undersized ones are not supposed to be delivered the same year, but are grown by extra feeding into fair two-year-olds for the next season.

When purchasing yearlings to be turned into a river, uniformity of size is not a matter of primary importance; the smaller ones find their way into thin water on the shallows, and the larger to places where the depth is greater, each thus taking a position in water best suited to its condition. Penned up in a stew, however, the large ones monopolise the food and grow rapidly, while the small ones are bullied and cowed until they are too frightened to feed, and remain small and stunted.

It must be explained that the amateur who had bred these fish follows out the late Mr. Andrews' plan of feeding sparingly on

artificial food, as there is a plentiful supply of shrimps, snails, and other natural food in his streams. The result of this treatment is, that not being accustomed to look for their two meals a day from the hands of an attendant they do not as a rule feed well when first put into a stew. Besides, not being accustomed to the frequent visits of mankind, such fish are always more or less wild and shy, and inclined to hide in dark corners. Hence it was not surprising that at first they did not feed freely on the minced liver and lights given to them.

Treatment of fungus in the stew.

The head keeper noticed, however, that a number were marked with whitish-grey patches which looked like fungus, and from the 16th to the 21st March forty-six were found dead. These were in other respects apparently healthy fish, but all had more or less fungoid growth on them. The growth was of the nature of the salmon disease (*Saprolegnia ferax*), but, whether it was this particular genus and species of fungus or one closely allied to it, is not important, and has not yet been determined. As a first experiment, the hatch regulating the water supply to the stew was raised, so as to give a heavier flow, and the result was regularly watched for eight days. Finding that no less than sixty more had succumbed, and acting under the best advice procurable, the fish were taken out

of the stew and immersed for fully five minutes in a strong solution of common salt. The next day one dead yearling was found; then, on successive days, one, five, eight, ten, five, thirteen, twelve. At this stage the yearlings were once more treated with a stronger bath of brine, and on the next two days twelve more deaths were recorded; so that, in all, 167 out of the 1000 had been lost.

At first it was imagined that some pollution of the stream might have taken place; no trace, however, could be found of dead fish in any other part of the river, excepting a single dead dace, covered with fungus, at a point two miles lower down; this conjecture of the cause was therefore dismissed as unlikely. Various theories were propounded during the epidemic, and as many more remedies suggested. All concerned were impressed by the fact that every dead trout was more or less covered by fungoid growth. Many were affected on the head, and in the neighbourhood of the gills, and some on the tail, which seemed to become ragged and out of shape.

At the early stages it was not considered prudent to give too much force of steam, as some of the weakly ones appeared unable to stand it. After the loss of the 167, as only two more could be seen with marks of the disease

upon them, the supply hatch was set full open, and a plank removed at the lower hatch to reduce the depth and give the strongest rush of water through the stew. The next day these two were found dead, but after this no further casualties occurred, and no more diseased fish were to be seen. We were assured that there was no sign of fungus on the rest of the same batch of yearlings bred by the same gentleman, and remaining in his streams. It should be remarked here, that many of the weakly fish before death appeared to be bent laterally, as if they had received some injury to the spinal column.

The question having been exhaustively discussed and fully considered, the consensus of opinion was that the growth of fungus commenced on the fish that had been injured, and did not appear to spread to the perfectly healthy ones in the stew. Every fish, however, affected by the fungoid growth succumbed, and neither of the remedies tried—neither immersion in brine nor giving a greater rush of water—appeared to be of avail to a fish once attacked by the disease. On the other hand, the fact that the growth did not spread to the healthy fish in the stew gave fair grounds for the inference that among healthy stock it is not contagious. The primary cause of the trouble

was therefore deemed to have been some injury to the affected yearlings, and the next point to consider was, how and when such injury occurred.

Origin of the disease.

There were clearly four possible ways in which this might have happened, viz.: I. While catching the yearlings out of the small streams, and turning them into the cans. II. During conveyance by rail or cart from the hatchery to the stew. III. While turning them into the stew. IV. After they were in the stew. The possibility of injury during the first two of these operations is ever present; the third is hardly likely. In the fourth case, with comparatively wild fish used to roam about in some length of stream, when first penned up in a stew it is only too likely to occur. Which of these was the cause of the disaster, or whether it might after all not be partly due to each, remains a matter of conjecture. The teaching is the humiliating one that, with all our study of the question, and with all the experience of numerous pisciculturists, there is no treatment known which is certain to succeed; and that, unfortunately, in such a case the probability is that, sooner or later, every affected fish will fall a victim to the disease. The lesson, however, should serve to further impress upon trout breeders, as well as lessees of a fishery, the importance of taking

every precaution to prevent rough handling of the trout during their transference from the ponds or hatchery to the river or stew.

The injured or weakly stock having thus been eliminated, the remaining healthy yearlings in the stew soon became accustomed to the visits of the head keeper, and, at his appearance, congregated in the deep water of the shed, awaiting the meal of minced liver and lights. In very few days they commenced feeding freely, and, as a natural consequence, improved in condition and growth. At first 15lb. per week was given; but, seeing that every particle of this was devoured, the weekly allowance was successively increased to 30lb. in June, and ultimately in September to 60lb., at which maximum it remained. The fish would probably have eaten more, but the resources of the local butcher could not be relied upon for a larger supply.

The yearlings grew and improved in condition until the middle of December, when gradually they seemed to go off the feed, as noticed in the account of the previous year. It would be reasonable in respect to the adult fish to impute this loss of appetite to their gravid condition and the approach of the spawning season. The instinct of the young fish—foreshadowing the habits of the mature parents—

may, perhaps, account for it, but in any case this may be deemed the best time of year to transfer the fish from the stew to the river. If there is anything in the theory that artificially fed trout are not good at catering for themselves in the river, evidently the season at which they require a minimum of food is pre-eminently a favourable one for letting them acquire the habit.

Final results

On the 22nd December all the fish were taken out of the stew and counted, with the result that they were found to consist of 398 all well over ½lb., and 347 below this size; or 745 in all, representing a loss of 255 out of the original 1000. The smaller ones were returned to the stew, and fed for about a month longer, and the larger were turned into the stream. The largest of them were estimated at quite 1lb. 2oz., many were quite of 1lb. weight, and the majority were well over the ½lb. when put into the river. The size of these fish, none of which had reached the age of two years, was sufficient proof (if any is needed) of the wisdom of the policy of feeding liberally in the stew.

CHAPTER X.

GRAYLING.

IF the water on which the work of "Making a Fishery" is to be attempted already contains grayling, it is, on the whole, advisable to abstain from trying to increase the stock by the introduction of fry or yearlings purchased from any outside source. In a stream favourable for this species of *Salmonidæ* the natural reproduction is so rapid as not to require assistance from extraneous sources. The result of such assistance is usually to produce an undue preponderance of grayling in a river with the concomitant disadvantage of their being generally of small average size. If, from the action of a heavy flood, or other cause, the grayling should be found to have worked down out of the particular stretch rented, it may be advisable to stock up a little, but even in this case it should be done sparingly.

Given, however, a stream containing trout and no grayling, what are the advantages and what the disadvantages to be anticipated from their introduction? The first and most obvious advantage is the extension of the fly-fishing season. From early April to the end of May is the full extent of time during which there is any reasonable probability of a good rise of trout at small fly in daylight. June, where there is May Fly on the water, may be added to this. In July and August there is a chance of an evening rise, and in some rivers, especially the late spawning ones, the month of September is fairly good, during the day as well as the evening.

Advantages from introduction of grayling.

In respect to September fishing there is, however, the unfortunate circumstance to be considered that by far the majority of trout killed are females in which the eggs are developed to a certain degree, and the general condition of the fish has proportionately deteriorated. This accounts partly for the fact that in most streams where fishermen congregate the male fish largely preponderate, rendering it expedient to kill down males and spare females. When there are grayling in a river they should be protected until the middle of July, or better still, the commencement of August, but during that and the two succeeding months on most of

the favourable or calm days they rise well, and even in November and December, in all but exceptionally severe weather, there is more or less chance of sport for the fly fisherman with the grayling.

Sporting qualities of grayling.

As to their gameness, no one who has killed a 3lb. grayling on a fast-running Test shallow could indorse that oft-quoted dictum of Cotton as to their being "dead hearted." When hooked they show the best of sport, and even when apparently tired out will, at the first sight of the landing net, start off for a fresh rush, of so sudden and rapid a character as to fairly astonish the angler and sometimes destroy his presence of mind. Of course, if his attendant gillie is provided with an abnormally large net fixed to an absurdly long handle, he may succeed in scooping out the fish before it realises the full extent of its danger. It is true that they are very capricious, and as a rule take only the smallest of flies on the finest of gut, and frequently come short. After all, however, do not these very difficulties constitute in a considerable degree the greatest charm to a sportsman?

Probably the chief reason why grayling are not fully appreciated as sporting fish is their comparative rarity. In a chalk stream they are quite equal to trout in gameness, and certainly

rise more freely. Although they do not go to weed with the same pertinacity as trout, yet they try the hold of a hook more, and unless hooked in the leathery rim forming the outer margin of the mouth, get away more frequently than trout. If all the fishermen on a stream are also shooters, and are so wedded to that form of sport as not to be able to spare a day from the moors, the stubble, or the coverts, it is useless to provide grayling for them.

Disadvantages of introducing grayling.

What are the disadvantages, real and imaginary, to be anticipated from the introduction of grayling? The one most forcibly urged, and, if proved, the most serious one, is that grayling feed on trout ova. This has been stated so frequently and so positively, that I have devoted some time and trouble to work out the point. From the experience of many years on the Test, one conclusion, and one only, can be arrived at, viz.—that the assertion has been made originally on the authority of some one whose observations have been inaccurate. Many of those who dislike, or affect to dislike, grayling in a trout stream, have repeated the statement without either corroborating by independent experiment, or acknowledging that this so-called fact is based on the mere *ipse dixit* of some one whose assertions they have heard, or whose writings they have read.

Do grayling eat trout ova?

The majority of the Test trout at Houghton spawn during November and December, and the autopsy of many grayling killed during many years in these months, the spawning season of the trout, has failed to produce a single specimen of a trout egg. That the grayling congregate on the shallows where the trout are spawning is an undoubted fact; but do they not congregate in these same places at other times during the season? And is it not reasonable to imagine that the stirring up of the gravel at the bed of the river by the spawning trout will set adrift a number of shrimps, caddis, and other larvæ on which grayling feed, and would be present in considerable numbers? No one can say that a grayling would not take an odd trout ovum if by accident it came rolling down the stream with the other more usual forms of food. The fact, however, that autopsy has failed to disclose any of these eggs is sufficient to demonstrate that the presence of grayling on a shallow below spawning trout is not due to their desire for the eggs as a staple form of food. Besides, have these eminent authorities who make the assertion with such persistence ever noticed how rapidly ova sink in a stream, and how short a distance they travel before adhering to the stones, and being lost to sight?

Alleged antagonism of grayling and trout.

It is said, too, that where grayling are plentiful the trout gradually fall off in numbers and condition. By some it is urged that this is due not only to the trout being hunted, but also to some occult cause which prevents both species from thriving in the same water. That large grayling will drive small trout off their favourite ground is an undoubted fact. It is also an undoubted fact that large trout will hunt smaller fish, whether grayling or their own brethren, from their feeding or resting places. It is like boys at school; the big ones will at times bully the little ones, and render their lives a misery. Is not this, however, equally true of all living creatures in a state of nature, and is not the modern teaching of natural history one prolonged series of repetitions of this propensity?

Francis Francis on grayling v. trout.

The late Francis Francis summarised the arguments on the question in that trite and pertinent style so typical of all his writings. He said that, if a river is so fully stocked that the food supply is only just sufficient for the trout in it, the introduction of more *Salmonidæ*, whether grayling or trout, must produce a deleterious effect on the condition of the fish. Just as well, he suggested, would a farmer turn out in a meadow fifty beasts in addition to 500 sheep if the pasturage would barely suffice to feed that number of sheep only. Does anyone

who has taken the trouble to examine the weeds and mud in the bed of a South-country chalk stream seriously doubt there being an enormous superfluity of food in the form of crustacea, molluscæ and the larvæ of *Ephemeridæ, Perlidæ*, *Sialidæ*, *Trichoptera*, &c., above any possible, not to say probable, requirements of the fish contained in the river? Some fishermen declare that they hate grayling and grayling fishing. For them there is no salvation, except to rent water not containing *Salmo thymallus*, and refrain from introducing them.

Conditions under which grayling thrive.

Before determining to introduce grayling into a stretch of water, it is necessary to consider whether they are likely to thrive and increase. It may be well to recapitulate briefly the natural conditions required in a stream to give a fair prospect of success in the experiment. Grayling, to be in perfect condition, require bright, sharp gravel shallows on which to spawn and to clean themselves after spawning. They must also have comparatively still deep places in the water, to which they retire after spawning, and in hot weather, or when scared from the shallows. They do well in hatch holes, and rise far more freely than trout in such places. They are moderately hardy, and can bear, without deleterious results, a considerable variation

in the temperature of the water. Above all, they must have an abundant supply of suitable food, in the form of shrimps, snails, caddis, larvæ of Ephemeridæ, *et hoc genus omne.* The presence of a fair quantity of weed is necessary, alike for their protection as for the successful development of those forms of animal life on which they subsist.

Tendency of grayling to work down-stream.

All authorities on the subject have from time immemorial laid it down as an axiom that the invariable tendency of grayling in a river is to drop gradually down stream. Although there are undoubtedly grounds for supporting this theory, it must not be considered as a fixed and immutable law of nature. I propose devoting some space to the consideration of two rivers in which I have had the opportunity of collecting reliable information.

Grayling in the Test.

The first grayling introduced into the Test are said to have been turned in at Leckford. This was many years ago, and in 1877, at which date my experience of that charming river commenced, there were few, if any, grayling above the Sheepbridge shallow at Houghton, but from that point to the salmon water, at Broadlands, and possibly even lower down than that, they were plentiful. Evidently, if the statement as to the first introduction of grayling is accurate—and there is no reason to doubt it—

this was a case which bore out the generally accepted theory, that they drop down stream.

In the year 1879 the capture of a grayling of 1½lb. on the Marshcourt Shallow, about one-and-a-half miles below Stockbridge, and six or seven miles below Leckford, was deemed quite remarkable. During 1880, 1881, and 1882 odd grayling were killed in the upper reaches of the Houghton Club water. In October, 1883, three days' fishing at the upper part of North Head Shallow yielded twenty-three, weighing 34¼lb.; and this part of the water was found to be fully stocked with grayling, many of large size. The point at which these grayling were taken is fully three-quarters of a mile above the highest point at which the members of the club considered it worth their while to fish after the close of the trout season. Evidently this was a case in which they had pushed up stream to a favourable place, possibly because the natural increase in their numbers had impelled some proportion to migrate, so as to avoid overcrowding. Unfortunately for the experiment, soon after this a systematical carrying of grayling to the upper reaches was put in practice, and in a few years they were plentiful all over the Houghton water.

Introduction of grayling to the upper Kennet.

The second river on which I have had experience of introducing grayling was on the

upper reaches of the Kennet. Some years since the old Hungerford Club turned a few grayling into their water, and whatever may be the opinion of local anglers as to the effect on the fishing, they certainly took favourably to the stream, grew to a good size, and increased and multiplied. This experiment was tried at a place some five or six miles below the particular length referred to, and, as far as could be ascertained, no grayling had ever been seen in the part of the stream under my control. It was decided to introduce a comparatively small number into the lower half of the water only, so that, if the theory of grayling not working up-stream was correct, anyone desirous of avoiding them could do so by devoting his attention to the upper portion of the fishery only. Another reason for selecting the lower water for the purpose was that it was considered to be better adapted for them than the upper reaches. Mr. Andrews kindly offered to make a present to the fishery of a few two-year-old grayling, as a nucleus from which in the course of time the future stock would be produced. After due consideration and consultation, a suitable place was selected for their introduction—a tributary stream, shallow throughout, flowing over clean gravel, an eminently suitable spawning ground for either trout or grayling, not sluggish in any

part, nor yet very rapid. It is crossed at the lower end by a bridge, and a short distance above its junction with the main river was the point suggested. On May 15, 1893, accordingly, 135 bright, healthy little two-year-olds, averaging quite 7in. in length, were turned adrift to shift for themselves.

During the summer months the question of purchasing a few more was under discussion, when we heard that a proprietor of water lower down the river was desirous of netting out some of his grayling, as he thought they were increasing too rapidly, and were likely to crowd out his trout. It appeared absurd that in one part of the Kennet the lessees should contemplate a serious outlay on grayling for stocking purposes, while the owner of fishing rights only a few miles below should be trying his best to kill down a considerable proportion of the grayling in his own water. After some hesitation I represented the facts of the case to this gentleman, and was gratified at the truly sportsmanlike spirit in which we were invited by him to take as many as we required, and the keeper was instructed to render every facility in his power.

Netting grayling for stock.

On September 25th nets, men, fish carriers, and all other necessary appliances were conveyed to the part of the water indicated by the

head keeper of the estate as the most likely for the purpose. At the first glance it was obvious that the growth of weeds was too luxuriant to hope for a successful day. However, being on the spot, it was decided to make the attempt, and the plan suggested in the chapter on netting was adopted, viz., a purse net as a stop, and a heavy drag net followed at a distance of about ten yards by a double-walled trammel. The first two or three pulls were not encouraging, only producing some eight or ten little grayling of about ½lb. each.

A deepish hole with a morass of heavy weeds immediately above it, and a sharp shallow, also much overgrown, below it, was pointed out as a good lay for the fish. The stop net could not be fixed on the lower side of the hole, as the water, forced into a contracted channel by the growth of weeds, was too rapid to admit of the foot or ground line being kept down by any ordinary weight of leads. The space altogether was too circumscribed to admit of the second net being dragged, so that it was necessary to work with the heavy drag net alone. Presuming that the grayling were in the hole, the danger was that, if the fish ran down in front of the net, they would dart over the shallow into the weeds below, and be lost for the day. After the net had been stretched across just above

the hole, I took up my position below in the water, just where it commenced to shoal, and the men dragging the net slowly drew it round towards the landing bank. A number of grayling, disturbed by the motion of the men and the net, were heading down stream, but by splashing about in the water I contrived to turn them, with the result that seventeen very good grayling, from ¾lb. to 1¼lb. were secured. All told, the day's netting produced thirty-eight grayling, besides two pike, one chub, one roach, and two dace.

The grayling were put into the fish carriers and conveyed as rapidly as possible to their destination. Grayling are far more difficult to transport than trout, and the day being warm, frequent additions of fresh water were necessary *en route*. Only five succumbed, and the remaining thirty-three were turned into a mill pond at the lower end of the water. After the weeds had been cut two more days' netting in the same portion of the river yielded 147 grayling, of which 145, averaging nearly 1lb. in weight, were safely transferred, part to the same mill pond and the remainder to a broad shallow at the extreme lower end of the water. Thus 178 adult grayling and 135 two-year-olds were introduced into this part of the Kennet, and what the result might be—whether they would

remain in the water or not, whether they would work up the stream or down, whether they would rise at fly and give sport, or whether they would neglect surface food and live on shrimps, caddis, and other forms of animal life in mid-water or on the bottom, and be voted a nuisance by future generations of anglers on the Upper Kennet—these are matters of conjecture which it is hoped the future will satisfactorily elucidate.

Grayling working up-stream.

In the autumn of 1893, when netting the river for pike, two grayling were taken in a hatch hole at the top of the small stream, where the Andrews two-year-olds had been turned in. They were, of course, returned uninjured to the water, and when netting the same hatch hole for a second time three days later, the same two grayling were again taken and returned. This hatch hole is, as measured on the Ordnance map, about 500 yards above the place where the two-year-olds were turned in. Here again they had worked up-stream.

When netting the upper part of the same water in the autumn of 1893, the keeper reported that he took and duly returned a grayling about ½lb., at a point some considerable distance above, and where a fish working up from below would have to pass several obstacles. In the following autumn of 1894

in my own presence, a single grayling, the weight of which I estimated at ¾lb., was again taken in the same place, and I thought it prudent to transfer this fish to the lower water. The point at which this fish was thus taken in two consecutive years was one mile and 750 yards above the place where the Andrews two-year-olds had been turned in, and all the grayling from Hungerford had been put in much lower down the river. Hence, it is fair to infer that it was one of the Andrews grayling. To make its way from the bridge where they were originally introduced into the stream, to the place where it was netted, it had not only to work one mile 750 yards up stream, but to thread its way through a complicated series of carriers and over three large sets of hatches. Here is a most undoubted case of a grayling working up-stream.

CHAPTER XI.

DISTRIBUTION.

THE object of this chapter is to consider the tendencies of trout to work up or down a stream, the motives underlying such tendencies, the seasons at which they occur, and generally the policy to be pursued in attempting to interfere with the instincts of the fish by artificial removal from one part of a stream to another. The natural tendency of fish to shift their quarters is in obedience to the universal law of nature, which has implanted in all animals a desire to preserve the individual and to perpetuate the species.

Natural tendencies of trout to travel.

The first and most important part of this work is evidently that of preserving the individual, and hence it may be inferred that the strongest instinct in the fish is that of self-preservation. Among the conditions necessary for success in this, the essential ones are, a

sufficient supply of suitable food, proper shelter, and protection from enemies. Reasoning from these premises, the conclusion to be drawn is, that the causes prompting the movements of fish in a river, arranged in their order of priority, spring from the instincts of food, shelter, fear of enemies, and reproduction; as regards the distance traversed by fish, the last factor takes precedence of the others.

Working up streams to spawning grounds.

In streams consisting of alternate shallows and deeps, the trout in the early autumn are generally found in the deeps, and remain in that water until the instinct of reproduction impels them to seek their spawning grounds. They will then make their way for great distances up to quick-running shallow water, with bright gravel bottom which is suitable for the deposition of the ova. Water of this character may be found in the main stream, or in tributaries or carriers, and trout will spawn in any of them. They appear, however, to give a preference to narrow tributaries, probably because, being fed by springs filtering up through the chalk and gravel, the water in them is free from the sewage and other pollutions present in the main river, and better fitted for hatching-out the ova successfully. The eggs, having been deposited by the females and fertilised by the males, hatch out in due

course, and the alevins, after absorbing the yolk sac, become fry. The fry remain together in the thinnest water of the shallows until they have grown to about the size of small minnows, and then they disperse.

Movements of trout immediately after spawning.

The bulk of the small trout in a river are usually found in shallow water, and in the early spring, after spawning, many of the parent fish take up their positions behind large stones, weed beds, or in other favourable places in slack water on the shallows, until they get in condition. In the emaciated state in which both females and males are left by the exhausting process of spawning they require a considerable amount of food to restore them to strength and vigour. A large proportion of this feeding up is unfortunately carried out at the expense of their weaker progeny, and the less the natural food supply on a shallow the greater is the number of victims required to satisfy the appetites of the adult fish. That so small a proportion of the naturally-bred trout in a river arrive at maturity is no doubt to an alarming extent due to their being devoured wholesale by these larger fish. The same experience is so universal in salmon rivers, that one of the reasons urged for the destruction of kelts is, that as each kelt destroyed means saving the lives of many hundreds of parr and

smolt, it would in the end tend to increase the stock of salmon in a river.

Habitat of large trout in hot weather.

As the season progresses, and the weather becomes warm, the larger trout are more and more inclined to keep in the deep water during the daytime, coming on to the shallows at dusk to feed on the minnows, crustaceæ, molluscæ, winged flies and their larvæ. Probably this desire for deep water is in obedience to the instinct for seeking shelter from the heat of the sun. Whether the fish are in the weeds, which are usually of more luxuriant growth in deep water than shallow, whether they lie close to the bank in the shade, or whether they merely keep close to the bed of the river, they are more or less able to obtain the desired shelter.

Tendency to work into carriers for Mayfly.

In many rivers the Mayfly is more plentiful in carriers and tributaries than in the main stream. Any reason advanced to account for this must at least be the result of conjecture; but I am inclined to think that the Mayfly larva, although its habitat is in mud of a particular sort, does not flourish in, but, on the contrary, avoids, portions of a river where the bed is that black fetid mud, which is the result of decomposition of vegetable matter, sewage, and other pollution. If this theory is accurate an additional incentive is provided to impel owners and lessees of fisheries to try and pre-

vent pollution. Already we know that trout ova do not hatch well in polluted water, and now there is some foundation for the belief that it is more or less fatal to the Mayfly, the best of all food for large trout. As might well be expected, the fly being more plentiful in these by-streams, trout are inclined to work up into them immediately before the hatch of Mayfly.

Tendency to congregate in hatch holes.

In a water meadow country trout will find their way into the carriers when full of water, and as the level is drawn down they congregate in hatch holes and other deep parts of these smaller streams. Sometimes the result of this is that they are too plentiful for the supply of food, and, as a natural sequence, they go back both in condition and colour. Generally, throughout a stream there is a tendency for trout to work up until they arrive at a hatch, or some other obstruction, when, except in a very high water, they often settle down, and take up their habitation in the depths of the nearest hatch hole.

Fear of enemies.

Fear of their enemies does not appear to be as potent a factor in influencing the movements of fish as the other instincts before alluded to. A reach of deep and comparatively still water in a stream fully stocked with pike of various sizes usually contains a few large trout, and although

the number of these certainly does not increase, any decrease is, as a rule, due rather to the direct and frequent attacks of the enemy than to any tendency to move away into a more favourable place. If the intended victim perceives the danger in time to elude the jaws of the pike, it makes a dash into the nearest weed bed, and is safe for the moment. Small trout are not often found in this character of water, but whether their absence is due to deep still water not suiting them, or to the fact of any frequenting such water, having been devoured by the pike, is a question open to discussion.

Fear of another deadly enemy—man—seems to be a characteristic of trout in a state of nature. Thus on a length of a stream seldom fished, and on the banks of which there are few pedestrians, it is often impossible to get within casting distance of a fish, whether feeding on or near the surface, or close to the bed of the river. On another stretch of the same river, where there is a footpath, or a carriage road, or where anglers are continually walking up and down, a trout will, even in the brightest and calmest weather, take no notice of a passer-by until he is within a few yards. If rising it will slowly sink down in the water, and as soon as the man has got a few yards above or below

will gradually come back to its old position and resume its interrupted meal.

The birds that prey upon the fish give them no chance. The heron, standing poised on one leg in a shallow, will remain motionless for hours, and never stir until it makes the fatal thrust. The kingfisher darts from the bank or a twig and seizes the fry before it has an idea of danger. The swans, ducks (tame as well as wild), the dabchicks and moorhens, feed on the eggs or alevins which are incapable of moving any distance.

In respect to parts of the river infested by pike, or where heavy toll is levied by poachers, or where herons or kingfishers abound, moving the trout is a senseless course to adopt. The pike must be destroyed by nets, wire, trimmer, or other means; the poachers must be deterred or punished; and the bird enemies must be shot or trapped.

Having now dealt with the chief movements of the trout in a river, the reasons prompting them to make these movements, and the seasons at which they occur, the next point to consider is how and under what conditions it is desirable to counteract their migrations by shifting them from one character of water to another.

Inadvisability of moving fish during spawning season.

As far as the movements preparatory to spawning are concerned it is not advisable for

the lessee or owner of a fishery to do anything. If he did it would have little or no effect beyond that of adding to the severe strain inseparable from the act of reproduction. The instinct of the females to find suitable places in which to deposit their eggs, and the instinct of the males to follow the females, are so strong that nothing short of penning them in would prevent their accomplishing their object. In some cases fish will travel considerable distances to get to a particular shallow. A pisciculturist, whose statements may be accepted as most accurate, told me of an instance where he netted a female fish on a particular shallow, and carried her down to his hatchery. Finding that she was not quite ripe for stripping he turned her on to a shallow in the river close to the hatchery, telling his attendant that he would be able to net her in a few days and take the eggs. There was some strongly-marked peculiarity about this fish, and a week later he again netted the shallow from which he had taken her before, again caught her in the net, and this time took the eggs. He assured me that the distance from the hatchery to the shallow in question was fully two miles.

Moving fish after spawning.

If after spawning in a carrier the adult fish will hang about on or near the redds, it is well to remove them from the temptation of devouring

their own offspring. In very narrow streams they can sometimes be driven down, and into the main river, and at this time of the year this is no doubt the best plan. If they will not be frightened away, a handy keeper will often succeed in taking them out with an ordinary landing net. If this plan is unsuccessful they should be driven below the redds, and a short trammel dragged down will usually secure them. It is in either case well to carry them some distance from the mouth of the carrier in which they have spawned. Stress is laid here on not dragging over the redds, although, unless the eggs are hatched, probably no serious injury would accrue.

On wide shallows of the main river nothing but thorough netting is likely to be efficacious when desiring to move fish after spawning. It should not be resorted to unless absolutely necessary, because it cannot be undertaken before the early spring, and the tramping about of men hauling nets does tend to make the fish in the river shy. Besides, if the eggs are hatched, it is likely to break up the schools of young fry. As long as the fry keep together they thrive, but when they get scattered by artificial means, they usually drop down stream and get into deep water, which is not suitable for them, and holds a stock of their enemies—either pike or large trout.

Moving fish from carriers after Mayfly season.

When the trout work up into the carriers or ditches, in anticipation of a Mayfly gorge, they should be left there until the hatch is quite over and the fall of the imago or spent gnat a thing of the past. [It is, by the way, well to arrange that the water level in these carriers should be kept up during the Mayfly season, and the best of sport will often be obtained in such places.] If, however, after the fly is over, they do not make their way back, it is best to net them out, and remove them into the wider water of the main river, as otherwise they are only too likely to fall a prey to poachers. Wherever there is a risk of carriers or ditches in water meadows getting dry, the fish should at every opportunity, and especially just after the water is drawn down, be taken out and transferred to the main stream.

Moving fish from hatch holes.

As to the general tendency of fish to congregate in deep hatch holes, the extent to which they should be netted out and moved to other quarters depends on the comparative number of fish, and the size, depth, and general character of each hatch hole. Trout do not rise well in such places, but there is usually, proportionately to its size, a far larger supply of food in a hatch hole than in the reaches of the stream. Probably this plentiful food supply is the chief incentive to the trout to work

into and remain in this character of water. If some of the fish are not shifted from time to time, they will infallibly get crowded and lose condition.

Trout shifted from a hatch hole should be turned in above, unless there is any strong reason for not increasing the stock in the upper reaches. If they are carried down stream, it should be to some considerable distance. In fact, although the risk of loss and expense must invariably increase according to the distance fish are moved, it must be remembered that the further they are taken from their old haunts the less likely they are to find their way back to them. On the question of general policy when moving trout, some authorities advise their being taken down stream, and others that they should be carried up. From careful study of the natural movements of trout, it is obvious that their general habit is to work up stream, and the task of counteracting in a degree their natural tendency is therefore likely to be more effectually carried out by conveying them down stream.

Moving underfed fish.

Fish in a particular length of water are sometimes found to be almost without exception in poor condition. It is not only the larger and the medium-sized, but all, from the smallest natural-bred yearlings of two to three inches

in length to what may be considered as large fish for the river, are long and lean, and lacking in depth. They are not apparently old trout, with long heads and sharp teeth black in colour, and generally soft and flabby when handled; such cannibals as these should, of course, everywhere and under all conditions, be ruthlessly slain. The trout in such a stretch of water are bright and silvery in colour, well spotted, and prime in flesh, but narrow and thin. This want of condition is as a rule due to one and the same cause—called by some overcrowding, and by others insufficiency of food. The remedy is to net out as many as may be considered desirable, and transfer them to another part of the river where the food is plentiful and the stock sparse.

Effects of floods.

Chalk streams are not so subject to severe floods as the North-country becks, rising in some distant hill or mountain, pouring over falls, tearing through rapids, and hurrying their way down to the sea, or into larger rivers. Yet when a heavy flood visits one of them the large area of flat meadows covered with water gives an appearance of desolation, and causes alarm in the minds of those responsible for the management of fisheries situated upon them. This alarm, too, is frequently intensified by the well-meaning, but generally ignorant condo-

lence poured into one's ears by sympathising friends. They keep inquiring whether a great proportion of the trout have not been carried down by the force of the flood to neighbouring waters, and generally indulge in so continuous a chorus of condolence, mingled with Cassandra-like predictions of disaster, that at length one inclines to believe that there must be some stable foundation for this alarm. It is, perhaps, well, once and for all, to analyse and expose the fallacies underlying such irrational panic.

Force of stream in floods.

The elementary scientific principle of flowing water is that, however great the force of the stream may be on the surface, it decreases with each inch below the surface, and thus even in the case of the most turbulent torrent the water at a comparatively small depth flows only at a moderate pace. A fish like a trout, passing its life in the water, and being at various times and under varying conditions exposed to the full pace of a rapid stream, has found out the practical outcome of this scientific theory. Why should he be carried down *nolens volens* by the flow of water? Like "Brer Fox," of historic fame, he simply "lies low." In fact, during the heaviest flood imaginable there is never so strong a stream that a trout can neither stem it nor dodge it. Watch one

under the lasher of a weir, and note how it works its tail and fins, so that while just holding its own against the current it gradually sinks until it reaches a depth where progression is easy. Note, too, that even when on the surface in the full force of the stream a few rapid strokes of the tail will propel it straight up the bubbling foam in the very strongest rush of the water.

Even if a trout, seemingly unable to withstand the pressure of the stream, is carried down, before it has drifted five yards a vigorous stroke of its tail will have propelled it into an eddy, or still water at the side of the main current, where it can rest and return to its former position when the flood has subsided. No flood yet experienced has washed a single trout unwillingly down the stream for any great distance. A fish contented with its quarters simply makes its way to the slack water, getting further out of the full force of the stream, as the river rises, to make its way gradually back when the water has fallen to its normal level. A number of fish crowded in a hole below a set of hatches take advantage of the rise of water to dart up over the fall, and make their way to a quiet place above, where they can rest before continuing their journey upwards.

One practical observation of the subject is worth any number of theories evolved from preconceived and erroneous notions. The flood of November, 1894, was the highest recorded on South-country rivers for over forty years. Banks were over-flowed in all directions, and acres and acres of water meadows were covered, until the country for miles around had the appearance of a huge lake. It was suggested that all the trouble and expense of systematic stocking in the Upper Kennet had been thrown away. It was said that the irresistible force of the stream at so abnormal a height must have washed away all the yearlings and two-year-olds turned into the river. The fish, we were assured, had been carried away in great numbers. And some went so far as to express grave doubts as to the safety even of the larger trout indigenous to the river. On one point, and one point only, all agreed, viz., that when the floods subsided we should find hundreds of fish dead on the meadows, and that many more would have been carried down to the waters immediately below.

Fish in carriers after flood.

Of course, as to whether one's neighbours lower down the river had been benefited at our expense it was impossible to do more than conjecture. After the river had fallen, however, to something approaching its normal level, an

exhaustive examination was made of all the water meadows, with the result that only one dead trout and one dead pike were found in a stretch of four and half miles of the river. As a confirmation of the theory advanced here that even during a severe flood the tendency of the fish is to work up stream, it may, however, be noted, that on every spawning bed, whether in the river itself or carriers in the upper part of the water, there were found to be more redds than the previous year. This, however, may have been partially accounted for by the extensive stocking which had taken place. The bed of the stream, too, was throughout greatly improved in character by the thorough clearing away of mud and refuse, effected by the increased stream running over it during the continuance of the flood.

Tendency of trout to work up stream.

Thus we may take it as proved, that under all circumstances, even that of an extraordinary flood, the general tendency of trout is to work up stream. This is a matter requiring attention in every well-regulated fishery. It is manifestly the case, that in stocking and improving a length of stream, a certain amount of good is bound to accrue to the water immediately above, owing to the increased number of trout working up stream, and to the water below, owing to the destruction of pike, which are ever

tending to go down stream. The work of "Making a Fishery" is hence evidently not the occupation to be recommended to an intensely selfish man. If one has true sportsmen and gentlemen for neighbours, they will at the same time improve their own stream, or where, from economical or other motives, this is impracticable, will give every assistance in their power to those who are at their own expense doing good work to the river and to the entire district. Unless, however, the lessee of a piece of water is willing to lose a serious proportion of his fish, he must periodically net the top lengths of his fishery, and shift a good proportion of the trout thus captured to the lower reaches of his water.

Above all, and in conclusion, I would tender the advice to all attempting this class of work to preserve friendly relations with their neighbours, to respect their opinions, and bear with their crotchets. They should be just towards their keepers, liberal in their arrangements for payment of extra labour, and at times lenient even towards some of those suspected of poaching proclivities. They must not expect startling results in a short time; they must bear with equanimity the various *contretemps* inseparable from the difficulties of their undertaking. They must not be discouraged by their

apparent want of success in matters of detail, nor be annoyed at the adverse criticism of their fellow fishermen. They must go steadily and steadfastly on to the end, and, given health and life, are bound to succeed.

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